9.15.6

NPIC/P&DS/D/6-874
31 March 1966

MEMORANDUM FOR THE RECORD

SUBJECT: Visit [redacted] 25X1
25X1 [redacted] 18 March 1966

REFERENCE: Video Tape Transducer, Project #99753-6

25X1 1. [redacted] gave a
25X1 briefing on [redacted] with emphasis on the company's efforts in space video image converters. The company has done a lot of work in receiving signals from space and in transforming these digital and analog signals into photographic imagery by using CRT's and flying spot scanners. The equipment used is very special purpose and could not readily be used with standard TV systems. The system is primarily a continuous scan (vs a standard 2:1 interlace scan) read-out, which suffices for the still photography received from space.

25X1 2. [redacted] has also done a considerable amount of work with image improvement techniques. These efforts are based upon computer processing of the image and requires a digital input. Analog signals have to be digitized (with the subsequent loss of resolution) prior to computer manipulation.

25X1 3. Although [redacted] appears to be very capable and use up to date methods for electronic image processing, these efforts are very specialized and are patterned to space efforts which ar considerably different from the current in-house requirements of NPIC.

[redacted] 25X1

Distribution:
Original - Project File/DB (#99753-6)
1 - Chrono/DB

Declass Review by NGA.

clc

JAN 12 ... '66

NPIC PROJECT NO.

SECRET
CLASSIFICATION

P&DS
RESPONSIBLE COMPONENT

RECEIPT RB/OS

DISSEMINATED RB/OS

SUPPORT/SERVICE REQUIREMENT

(The following info is required when rqmts are levied by external organizations)

OFFICE ______ DATE OF RQMT ______ CONTROL NO. ______

NPIC DIV/DETACH PROCESSING RQMT ______ PROJ OFF ______ PHONE ______

SUPPORT REQUESTED OF ______ PRIORITY ______ DATE REQUIRED ______

(The following info is required when rqmts are levied for internal support)

DIV/STAFF ~~CSD~~ P-DS DATE OF RQMT 11 JAN 66 ~~6 December 1965~~ CONTROL NO. ______

SUPPORT REQUESTED OF P&DS PROJ OFF [redacted] 25X1

PRIORITY ______ DATE REQUIRED September 1967

1. BACKGROUND INFORMATION:

The work requested is in support of a Gen. Ops. : __ Photo interpretation proj.; X Non-photo interpretation project. It will result in: __ Hard copy report; __ Informal report (memo); X Basic service only.

Project Description:

Magnetic Tape To Photo Transducer

2. SPECIFIC SUPPORT/SERVICE REQUESTED: Support from NPIC will probably consist of:
__ Photographic; __ Reproduction; __ Mensuration; __ Graphics; __ ADP; __ Editing;
X Other (explain below) -- (Include statement as to estimated amount of work required of support component(s); i.e., number of contact prints, enlargements, boards, etc.)

1. Discuss with CSD their requirements for magnetic tape to photo transducer and survey industry for available components or capabilities to satisfy requirement.

2. Prepare development objective if required and solicit proposals.

3. Monitor contract.

4. Evaluate equipment and demonstrate to interested components.

3. ~~URGENCY JUSTIFICATION: (If immediate support is required a statement of justification must be made on this form.)~~ If R&D is not justified, complete memo to CSD recommending shelf components that will satisfy their requirements.

DATE OF COMPLETION

SECRET
CLASSIFICATION

NPIC FM 218 (Revised 5-65)

25X1

[redacted]

3.0 SPECIFICATIONS

3.1 Physical Characteristics

Dimensions

Height: 61 inches

Weight: 800 pounds maximum

Width: 42 inches

Depth: 28 inches

Temperature and Humidity

Temperature: 0° to 55° C

Relative Humidity: 30% to 90%

Power Requirements

Input Power: 117 volts $\pm$ 10%, tapped for 105-115-125 volts, 60 cycle, 30 amps (Will regulate and operate without changing taps from 105-125 volts)

or

230 volts $\pm$ 5%, tapped for 210-220-230-240-250 volts, 50 cycle, 15 amps.

Convenience Outlet: 4 outlets fused for 16A total

Signal Requirements

Video Composite Signal: 0.5 to 1.5 volts peak-to-peak composite, sync negative

525 Line Monochrome

525 Line NTSC Color

625 Line NTSC Color

75 ohm unbalanced

Sync Input: 75 ohms, 2 to 8 volt peak-to-peak

3.2 Operating Characteristics

Record Time: 30 seconds

Playback Time: 2-1/2 minutes (5/1 slow motion)

Continuous Updating

The last 30 seconds available except when interrupted for playback

Fast Search Facilities

Required action for playback can be found by remote control, aided by a seconds counter.

Stop Motion

Single frames can be played continuously

Animation Rate

When playing 5/1 slow motion, each field is repeated 5 times with artificial interlace. The animation rate is then 12 per second.

Stability

Jitter (Inter-sync playback), i.e., timing variations with respect to reference sync occurring at rates greater than 1 cps excluding video field rate multiples less than 0.5 usec peak-to-peak with AMTEC off.

3.3 Standards

The recorder is supplied for single standard operation. The standard can be changed if required by replacing 3 plug in circuit modules. Standards available:

7.16 MHz - 7.8 MHz - 9.3 MHz Dev., Mono/Color Pre-emphasis, 625 line, High Band.

7.06 MHz - 7.9 MHz - 10.0 MHz Dev., Mono/Color Pre-emphasis, 525 line, High Band.

3.4 Monitoring Facilities

25X1 Video: [redacted] CMC14/R 14-inch (35.6 cm) video monitor and a [redacted] 25X1
RM529 waveform monitor are available. Alternately a [redacted] 25X1
CYA17/RS Color monitor can be supplied.

3.5 Accessory Equipment for Color Operation

1. AMTEC
2. Record Color Transcoder
3. Playback Color Transcoder
4. Auto Chroma Radius Compensation
5. Processor Color Accessory Board

3.6 Video Performance

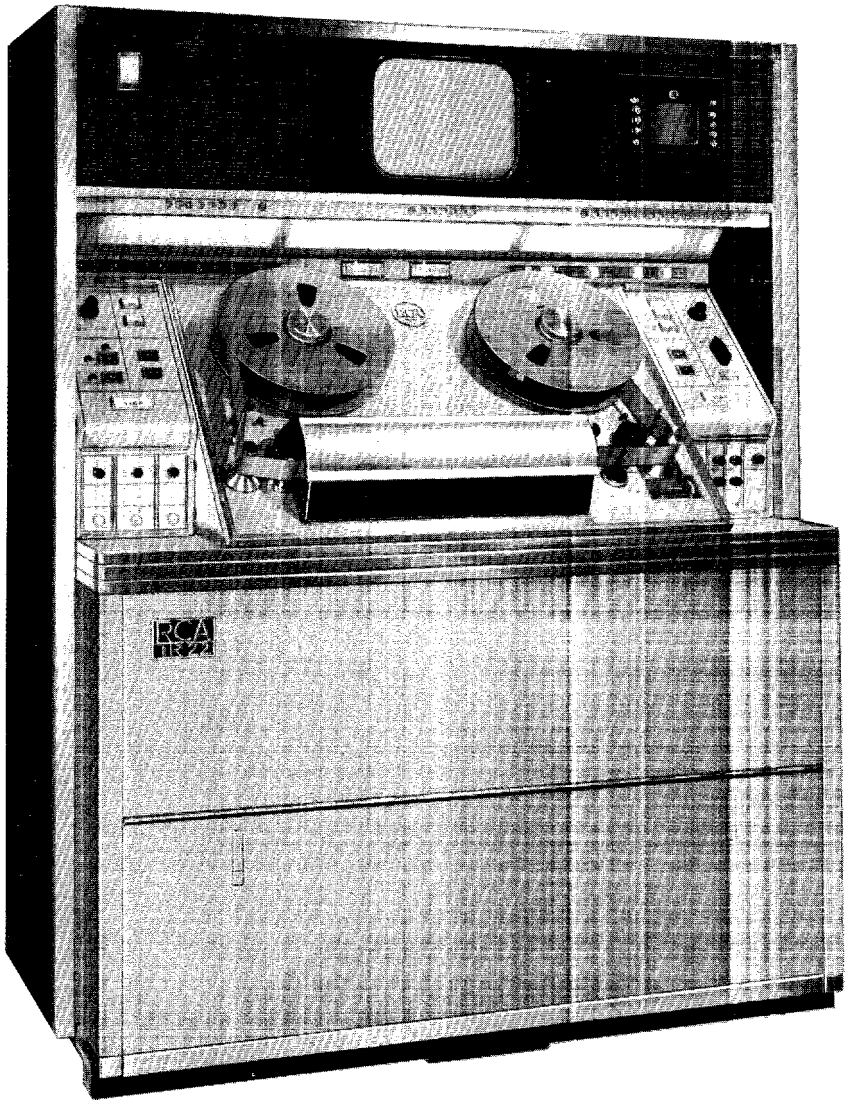
	525/60 High Band
MONOCHROME	
Bandwidth:	4.5 MHz - 3 db
Response will be within ± 1 db of these values referenced to 100 kc	
Signal-to-Noise Ratio:	40 peak-to-peak video to rms noise (Monochrome and Color)
Transient Response: (Utilizing 2T sine^2 pulse)	Maximum K factor 3%
Low Frequency Linearity:	2% Blanking to White (Max.)
Rise Time: (.02 usec or less rise time on input pulse)	0.12 u/sec maximum
COLOR	
Bandwidth:	
with NTSC input, Luminance	2.5 MHz - 3 db
with R-G-B input, Luminance	4 MHz - 3 db
Signal-to-Noise Ratio:	40 db peak-to-peak video to rms noise

Differential Gain:	Less than 4% Blanking to White
Differential Phase:	Less than 5° at 3.58 MHz off disc
Moire: (Color bars 75% modulation, 3.58 MHz)	37 db maximum
Video (International)	625/50 High Band
MONOCHROME	
Bandwidth: Response will be within ± 1 db of these values referenced to 100 kc	6.0 MHz - 3 db
Signal-to-Noise Ratio:	37 db peak-to-peak video to rms noise (Monochrome and Color)
Transient Response: (Utilizing 2T sine^2 pulse)	Maximum K factor 3%
Low Frequency Linearity:	2% Blanking to White (Max.)
Rise Time: (0.02 usec or less rise time on input pulse)	0.08 u/sec maximum

Approved For Release 2005/06/23 : CIA-RDP78B04770A002700040032-5

Deluxe TV Tape Recorder, Type TR-22[illegible]

- Fully transistorized for dependable performance
- Built-in Automatic Timing Correction
- Plug-in Color ATC accessory available



Deluxe TV Tape Recorder, Type TR-22D

This deluxe, transistorized tv tape recorder maintains a high measure of excellence in producing trouble-free, error-proof tape recordings and in obtaining high-quality reproduction from recorded tapes —both color and monochrome.

This new TR-22D model is designed for added facility in color taping operations. Accessory color modules merely plug into the space provided for them. Tape handling has been improved to increase color tape life. A number of technical innovations are included to fortify the reliability and repeatability of producing color tapes. The result is a machine on which good color tapes can be produced time after time—by semi-technical personnel.

Completely self-contained in a modern compact console, the TR-22D is functionally designed for utmost ease of operation. Included in the basic recorder are such quality features as automatic timing corrector (for monochrome operation), tape lifter, a tape motion sensor, and latest-design transistorized audio, picture and waveform monitors.

The TR-22D will accept a number of deluxe accessories that may be housed within the compact console. These accessories include automatic timing corrector (for color operation), dropout compensator, and electronic splicer. They are all transistorized, all modularized, all designed to plug into the spaces provided for them.

Description

Color Advantages

The TR-22D is designed to the exacting standards of color tv. It can be used for color taping by merely plugging in color ATC modules. This accessory fits into the planned space in the basic console. Addition of color ATC permits making and playing of color tapes with the same kind of reliability and repeatability experienced in monochrome taping.

A new headwheel servo system includes four high-performance modes of operation—tone wheel, switchlock, pixlock, and linelock. The fourth mode, linelock, is particularly valuable in playing color tapes. It will handle tapes made with a more than normal range of timing errors, thereby increasing the playability of color tapes from outside sources.

Transistorized for Reliability

The advanced circuitry of the TR-22D uses semiconductors to perform all circuit functions necessary to the recording and playing back of television tape. Use of long life transistors and other solid state components makes possible significant savings in size, weight, and power consumption. Transistor circuits provide reliability over long periods of time, reduce maintenance, and give dependable performance.

Stabilized for Uniform Quality

Uniform picture quality is a result of stabilized circuits in the TR-22D. These circuits function to correct themselves, holding a high-level of performance over long periods of operation. They compensate for changes that may occur with component aging. Operators are freed from constant attention and frequent "touch-up" of controls.

Fully Instrumented Operation

Another significant contribution is a unique signalling system which indicates faulty operation during recording or playback. A series of indicator lights point out operational modes, warn operators of potential trouble, and help technicians quickly pinpoint and correct malfunctions, should they occur.

Automatic Timing Corrector

Transistorized circuits to provide electronic compensation for geometric distortions which may occur in some recorded tapes are built into the TR-22D. These distortions (skewing, quadrature or jitter) occur as timing delay errors and are virtually eliminated after passing through ATC. Serving as a continuous monitoring device, ATC automatically compensates for time delay errors, thereby assuring best possible playback quality.

Easy Handling Tape Path

The TR-22D is easier than ever to thread. This is made possible by using cone-shaped guide posts and a newly styled headwheel cover which provides increased access to the video headwheel and audio heads.

A tape lifter is included in the tape path to remove the tape from the master erase head whenever the machine is in the playback mode. This device is air activated and is comprised of a sapphire rod on which the tape rides. Use of the tape lifter results in longer tape life, less tape scratching and also longer life for the master erase head.

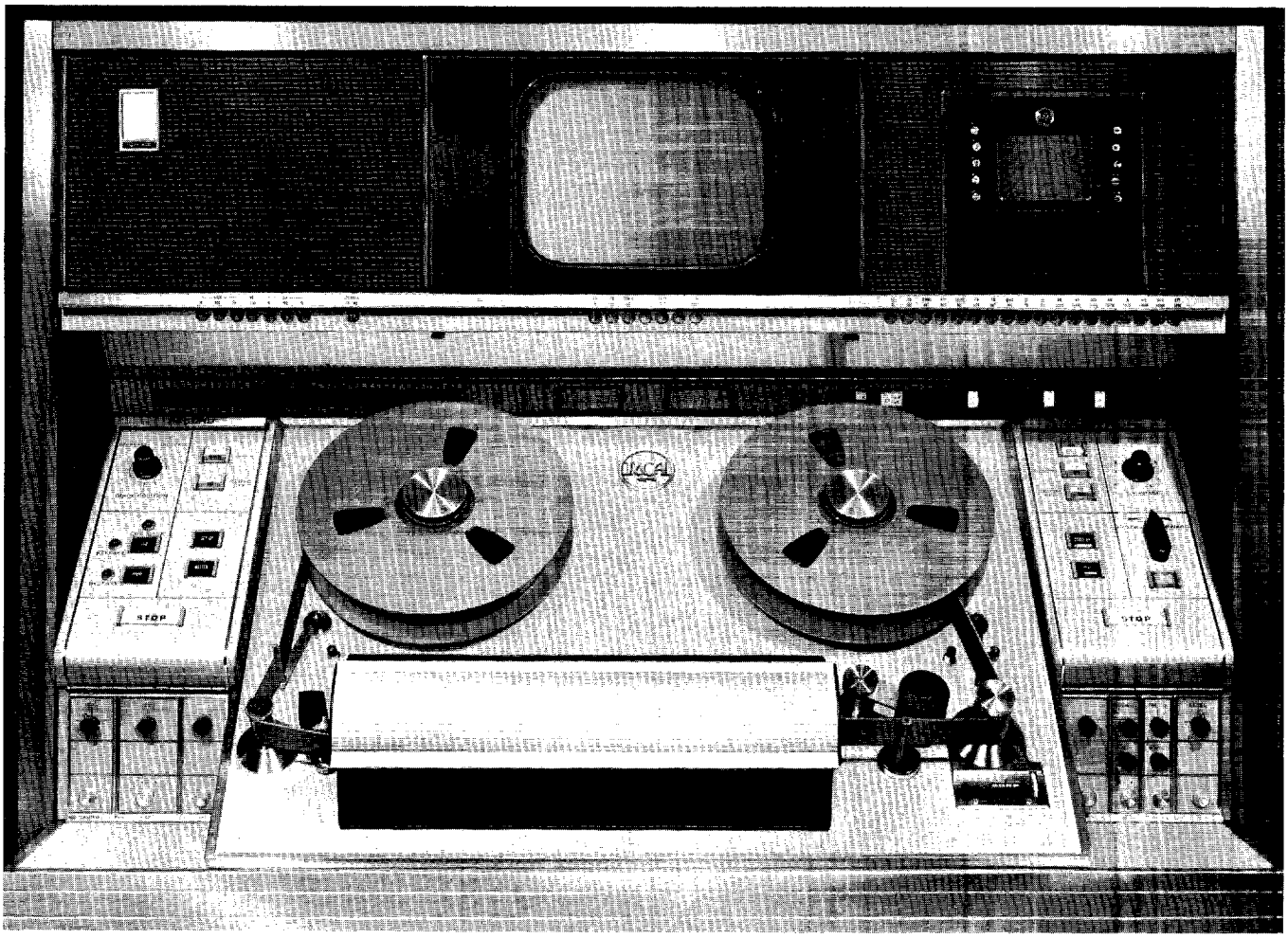
Switchable Standards

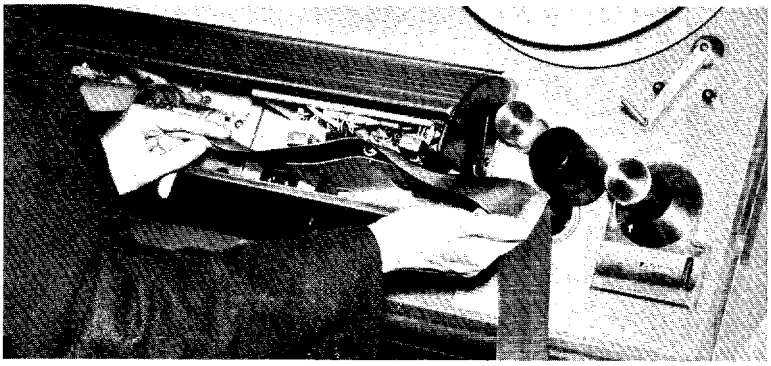
In recognition of the increasing importance of international exchanges of television programs, the TR-22D is available in two basic models: (1) a 525-line machine, and (2) a switchable standards machine for 525/625/405 or 819-line operation. In the latter model, either 405 or 819 line operation may be specified as the third standard.

To change from one standard to another, an operator merely moves a selector switch to the desired position. This master switch changes all machine circuitry—i.e., monitors and CRO—to the desired standard.

Built-In Two-Speed Operation

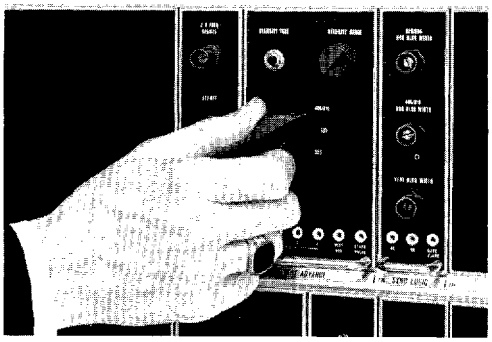
Circuits to permit choice of operating speeds—7½ or 15 inches per second—are built into the TR-22D. By switchover to half-speed recording (7½ ips), substantial savings in tv tape stock can be realized. Use of a narrow track headwheel assem-



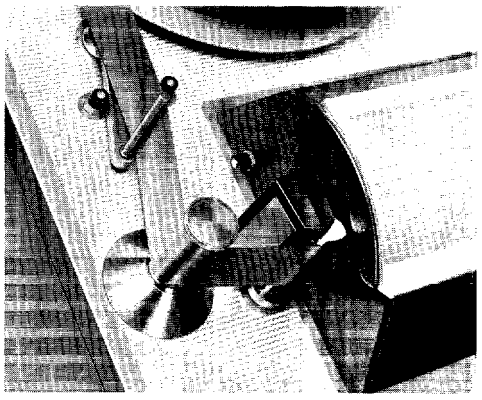


EASY THREADING FOR QUICK-ACTION TAPE HANDLING . . . Headwheel cover slides back against tape deck for easy threading . . . from natural, comfortable position. This expedites tape handling, splicing and editing.

CONTROL CENTER . . . All operating functions of the TR-22D are centered at this modern tape deck—functionally styled to make operations easy and to encourage consistently high quality pictures with minimum effort. Recording and playback controls are built on separate panels arranged at either end of the tape deck to reduce the possibility of human errors. This is the quality control center—the "business" end of the TR-22D recorder.

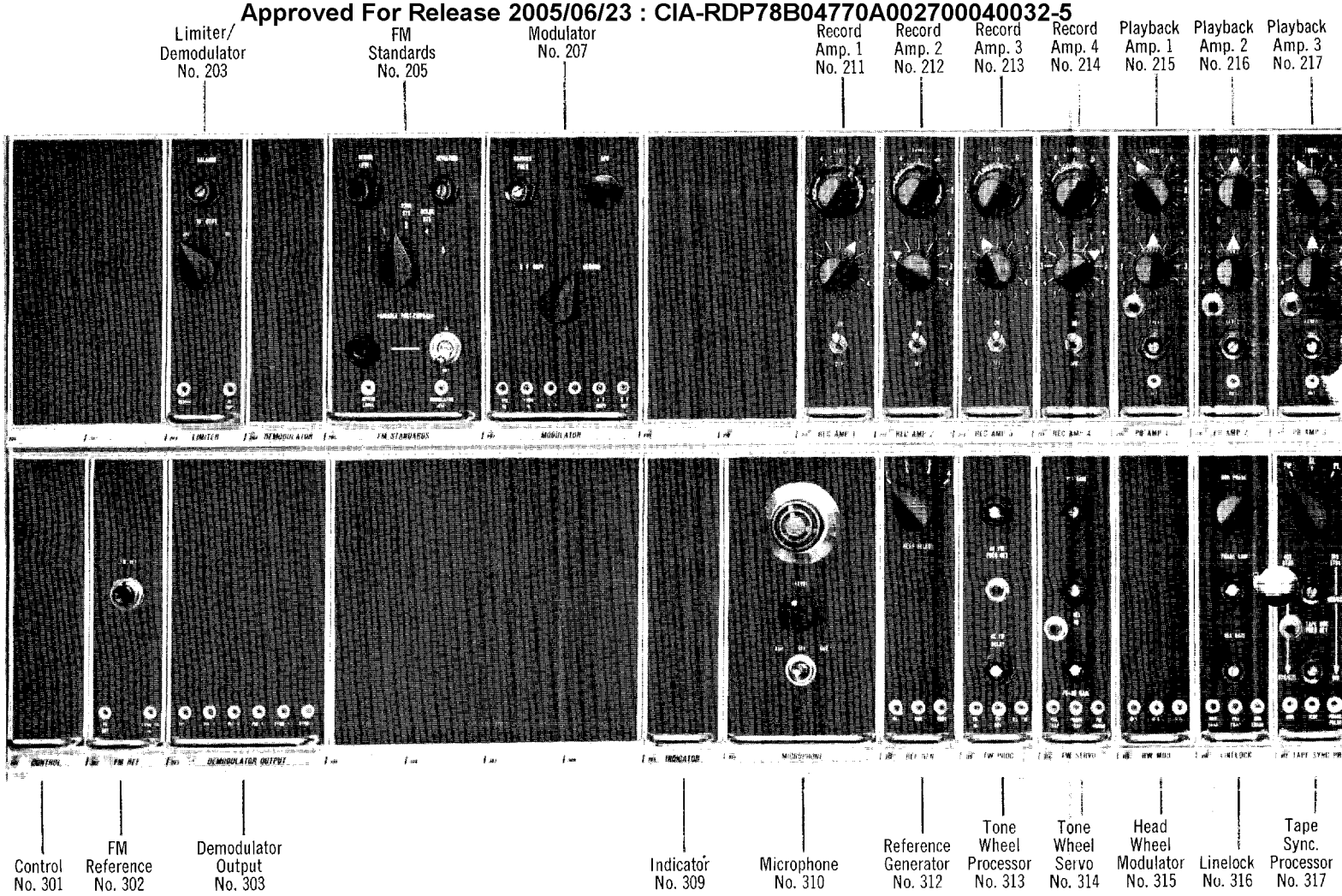


SWITCHABLE TV LINE STANDARDS FOR WORLD-WIDE USE . . . The TR-22D is available in a switchable standards model which provides instantaneous switchover from 525 to 625 to optional 405 or 819 tv line standards.



TAPE LIFTER AND CONE-SHAPED GUIDE . . . increase tape life and wear on erase head at same time reducing tape dropouts.

Approved For Release 2005/06/23 : CIA-RDP78B04770A002700040032-5



TR-22D Module Bank . .

Limiter/Demodulator—No. 203
FM signal is converted to push-pull, passed through several stages until overall limiting characteristic of at least 55 db is achieved. Contains demodulator and output filter circuits.

FM Standards—No. 205
Video input is pre-emphasized to make a standard recording. A five-position switch selects proper pre-emphasis for monochrome, color, or special standards. Post-emphasis for playback is also provided.

Modulator—No. 207
Clamps pre-emphasized video at the sync-tip level to modulate a capacity-diode-controlled heterodyne type modulator. Circuitry included for rf copy faciltiy.

Record Amplifier 1—No. 211
Output from record delay amplifier No. 1 is increased in level to a value sufficient for recording on tape.

Record Amplifier 2—No. 212
Output from record delay amplifier No. 2 is increased in level to a value sufficient for recording on tape.

Record Amplifier 3—No. 213
Output from record delay amplifier No. 3 is increased in level to a value sufficient for recording on tape.

Record Amplifier 4—No. 214
Output from record delay amplifier No. 4 is increased in level to a value sufficient for recording on tape.

Playback Amplifier 1—No. 215
Gain circuit and equalizer amplifier for correcting variations of frequency response in Channel No. 1.

Playback Amplifier 2—No. 216
Gain circuit and equalizer amplifier for correcting variations of frequency response in Channel No. 2.

Playback Amplifier 3—No. 217
Gain circuit and equalizer amplifier for correcting variations of frequency response in Channel No. 3.

Playback Amplifier 4—No. 218
Gain circuit and equalizer amplifier for correcting variations of frequency response in Channel No. 4.

Guide Servo—No. 221
Control position of the guide to produce skew-free pictures. Functions in automatic, manual, record, and record-set modes of operation.

Delay/Output—No. 223
Delay video is time modulated line-by-line in the variable delay line. Output line drivers provide time corrected video signals for monitoring and processing.

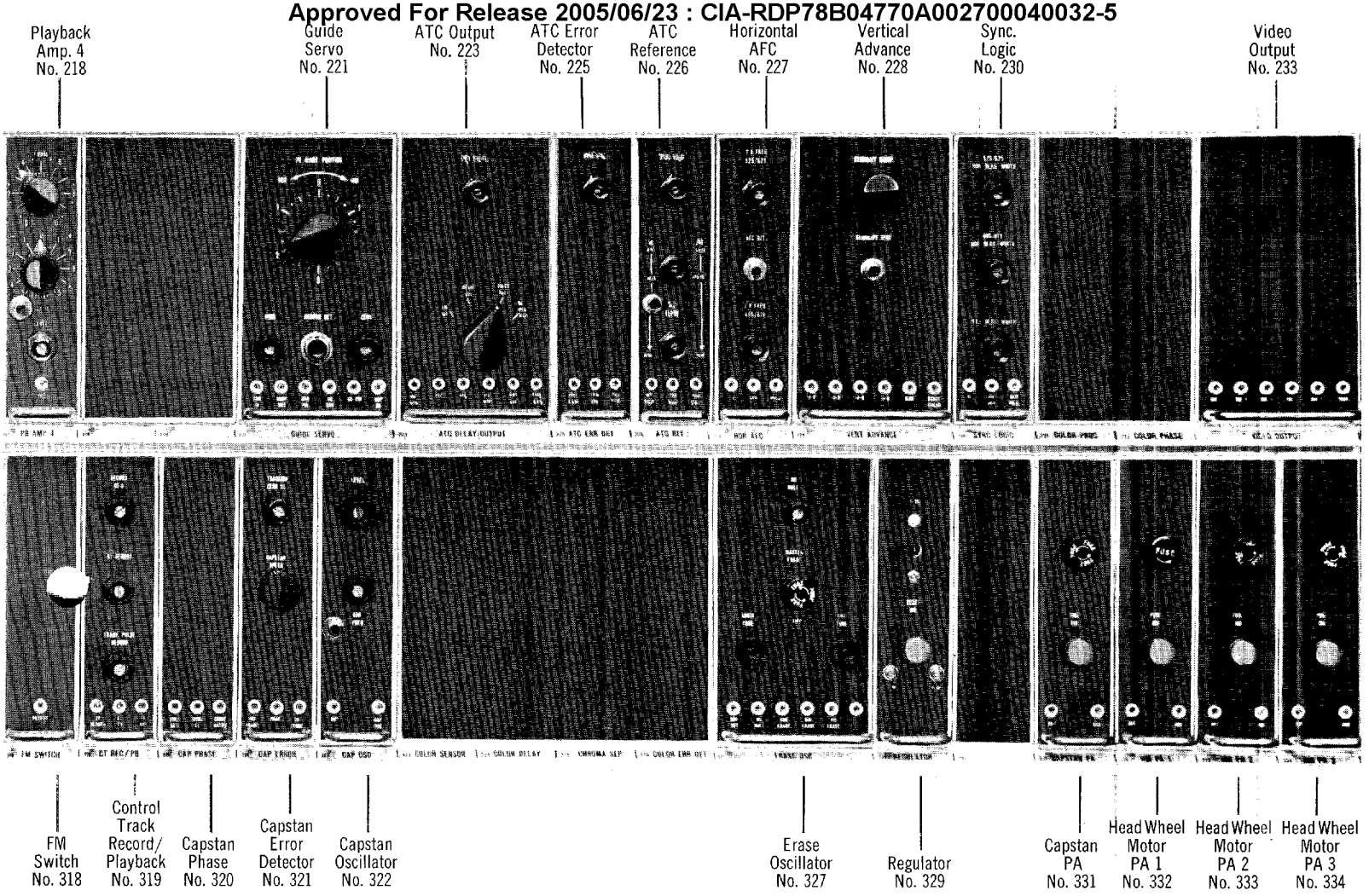
ATC Error Detector—No. 225
Generates error signal which is amplified (non-linearily) and fed to two phase spliters. Four error outputs drive the variable delay line.

ATC Reference—No. 226
Contains AFC which may be locked to local sync signal or tape sync signal. ATC trapezoid is generated from ATC pulse. A clamp sync separator provides a time corrector sync output to the processing amplifier.

Horizontal AFC—No. 227
Tape sync from the demodulator output is used to control the frequency and phase of a multivibrator. This, in combination with other circuits, generates a new horizontal sync, front porch, and blanking.

Vertical Advance—No. 228
Special circuitry counts out the number of pulses in a field, to determine very accurately the position for regenerated vertical blanking. Includes 3-position standards switch in switchable standards model.

Sync Logic—No. 230
Generates horizontal and vertical blanking; combines them into composite blanking. Combines tape sync and regenerated horizontal sync into composite regenerated sync. Generates a start pulse which phases the counting of the vertical [illegible]



Description of Functions

Video Output—No. 233
Two sending-end-terminated line drivers distribute video within the machine. Three sending-end-terminated line drivers provide outputs from the machine.

Control—No. 301
Part of control system. Provides inhibit logic and time delays.

FM Reference—No. 302
Provides two reference frequencies keyed in from crystal oscillators. References are introduced on alternate vertical blanking intervals and represent precise sync-tip and peak-white frequencies.

Demodulator Output—No. 303
Separates tape sync from the tape signal. Provides line drivers to feed unprocessed video to monitoring circuits and to processing amplifier.

Indicator—No. 309
Senses machine performance and lights trouble indicator in the event of malfunction.

Microphone—No. 310
Houses microphone and mike-cable reel, with microphone amplifying circuits. Permits operator to record on either audio or cue tracks.

Reference Generator—No. 312
Processes local sync to produce horizontal-rate reference, field-rate reference and frame-rate reference.

Tonewheel Processor—No. 313
Shapes the tonewheel pulse and also provides 960-cycle switcher drive.

Tonewheel Servo—No. 314
Derives error signal controlling the headwheel motor in the tonewheel mode of operation.

Headwheel Modulator—No. 315
Amplitude-modulates the headwheel motor-drive sine waves. Gives wide-band three-phase output.

Linelock—No. 316
Provides line-by-line lock-up in the Pixlock mode.

Tape Sync Processor—No. 317
Processes tape sync to produce horizontal-rate reference, field-rate reference and frame-rate reference.

FM Switch—No. 318
Switches between heads during playback, connecting the head scanning the tape to the output.

Control Track Record/Playback—No. 319
The 240-cycle control track signal is amplified, filtered to produce a clean 240-cycle sine wave, clipped, and shaped into a pulse.

Capstan Phase—No. 320
The preceding pulse feeds a chain of binary counters which divide the pulse frequency by eight to produce a 30-cycle output pulse

Capstan Error Detector—No. 321
A phase detector which compares incoming pulse to the local frame pulse and produces a d-c voltage proportional to the magnitude of the phase error.

Capstan Oscillator—No. 322
D-c error voltage controls the frequency of the oscillator which supplies the drive frequency for the capstan motor. Tape speed is thereby synchronized to local reference.

Erase Oscillator—No. 327
Supplies 87.5 kc erase and bias current to the audio and cue heads.

Regulator—No. 329
Provides regulated voltages to operate the transistor circuitry of the machine.

Capstan PA—No. 331
Power amplifier for the capstan motor.

Headwheel Motor PA 1—No. 332
Power amplifier for one of the three phases required by the headwheel motor.

Headwheel Motor PA 2—No. 333
Power amplifier for one of the three phases required by the headwheel motor.

Headwheel Motor PA 3—No. 334
Power amplifier for one of the three phases required by the headwheel motor.

bly (in place of the headwheel normally supplied) permits twice as many tracks to be recorded on the same length of tape—with full tape interchangeability with other machines, when operated at 15 ips.

Test and Set-Up Aids

Precision performance is standard with a TR-22D. All circuits, controls and monitors are fully instrumented so that technical personnel find it easy to maintain consistent quality. Complete checkout of recording or playback functions is at the operator's fingertips. A seven-position switcher permits monitoring of audio and cue channel information. The 14-inch picture monitor includes a 7-position switcher for checking picture information at various points in the recorder. Through a 20-position switcher, waveforms at key points in the TR-22D may be monitored.

Mode indicators show at a glance the mode of operation being employed while fault indicating lights point out to the operator areas which may be possible sources of circuit malfunction. A multi-meter used in conjunction with a 24-position module test switcher permits rapid checking of pertinent a-c and d-c voltages.

The Recording Process

The recording process centers at the tape deck and operational area. Before the tape gets to the headwheel, it passes over the master erase head which removes all previously recorded information. This clean tape then passes between the vacuum guide and headwheel where the FM modulated video signal is recorded. The tape next passes over the control track head where a 240-cycle signal is recorded. This signal will be used during playback to make sure that the video heads scan along their respective recorded tracks. A 30-cycle frame pulse superimposed on the control track is used to determine where the tape may be conveniently spliced.

Note: When operating with 50 cycle power, the control track frequency is 250 cycles, and the frame pulse rate is 25 cycles.

A program audio track is recorded along one edge of the tape, the area first having been erased by a separate erase head which is a little wider than the following record head. A simultaneous playback head, after the record head, allows operator to monitor the audio signal as it is being recorded.

On the other edge of the tape, the cue channel record head provides a means for recording cue information. This can be in the form of voice, tone or digital information. A special feature of the program and cue channel is that recording can be done independently of video recording; in other words, sound may be dubbed in while playing back or previewing the video signal. This cue channel is of such high quality it can be used as a second program channel if desired.

Time-tested features of RCA's TV Tape Recorders are now standard in the TR-22D. These include electronic quadrature adjustment, continuously variable winding speed, separate guide position control for record and play, air lubricated tape guides, brake release switch, magnetic tone wheel, master erase head, simultaneous audio playback and complete cue facilities.

MAJOR ACCESSORIES

The complement of production accessories available for the TR-22D includes an Electronic Splicer, a Dropout Compensator, and Color ATC. The recorder is pre-wired to accept all of these by merely plugging them in the module spaces provided for them.

Electronic Splicing

Splicing of TV tape, electronically, is achieved in the TR-22D by inserting accessory plug-in modules into pre-wired receptacles. With the splicer installed, program segments in color or monochrome can be added to or inserted in recorded material without mechanically cutting the tape. The splicer operates at tape speeds of 7½ or 15 inches per second. The splicer modules afford easy access to all components. When any module is removed, a by-pass circuit automatically returns the recorder to normal operation. Other features of the splicer include switchable standards and pushbutton electronic setup procedure.

Dropout Compensator

The TR-22D is also pre-wired for insertion of a plug-in Dropout Compensator module. The purpose of this accessory is to eliminate video dropouts caused by tape imperfections. This preserves picture quality and prolongs the life of tapes. For color or monochrome operation, the device employs a delay line principle which inserts previous line video in the space occupied by the dropout.

Color ATC

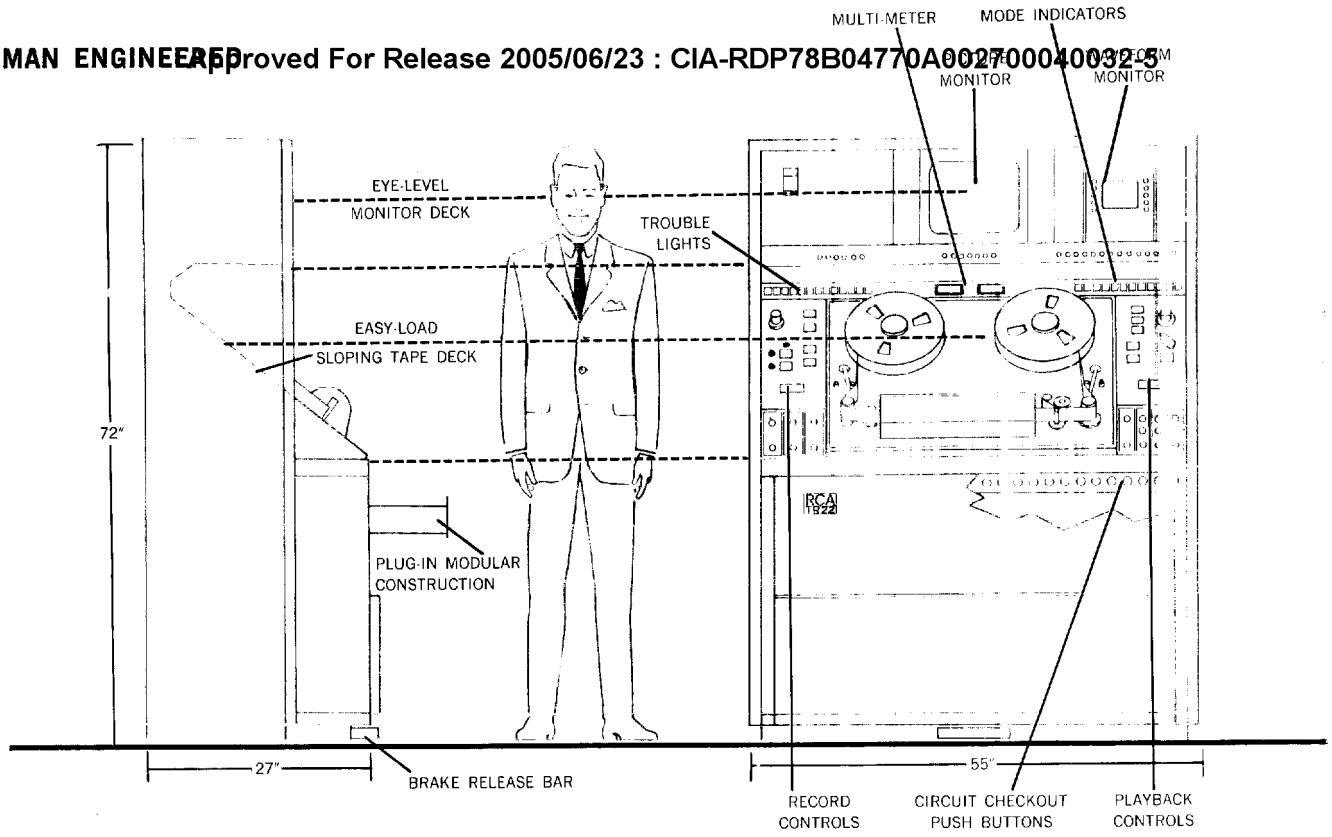
Insertion of the plug-in color ATC modules converts the monochrome TR-22D for color without further modification. Color playbacks then become an automatic operation, with the color ATC circuits offering precise stabilization and a high order of color performance.

COMPLETE LIST OF ACCESSORIES

(supplied complete—order by MI-number)

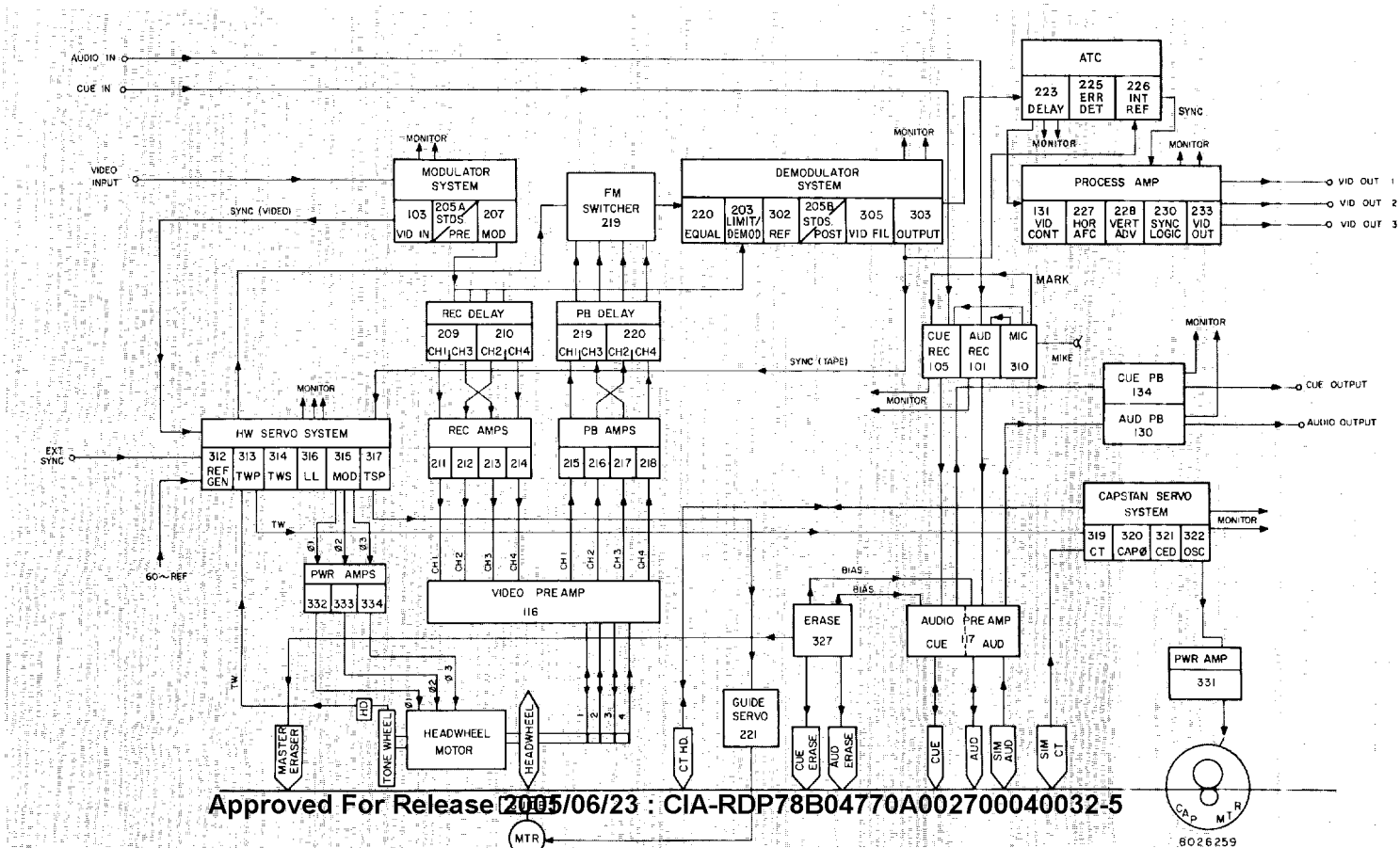
Automatic Timing Corrector (color)	ES-43581
Electronic Splicing Accessory	MI-40695-A
Dropout Compensator	MI-43309
Video Pre-Amplifier Module (spare)	MI-40603-A
Remote Control Panel (mode)	MI-40691-A
Remote Control Panel (signal)	MI-40692-A
Narrow Track (7½-15) Headwheel Panel Assembly (air bearing)	MI-40799
Headwheel Panel Assembly (air bearing)	MI-40790-A
Tape Splicer (15 IPS) including Tape Developer	MI-40772
Tape Splicer (7½ IPS) including Tape Developer	MI-40748
Splicer Table	MI-40592
Dolly Assembly	MI-40668

HUMAN ENGINEERING



Among the human engineering features introduced in the TR-22D are a 45-degree angle tape deck set waist-high for ease in loading reels and threading tape. Recording and playback controls have been separated to minimize errors. Monitoring facilities are located at eye and ear levels with the pushbuttons controlling their functions located immediately below each of the monitors. Also a series of warning lights, which operate continuously, prevent faulty recording. These features simplify the making and playing of quality color tv tapes.

FUNCTIONAL DIAGRAM



General

Recording Medium.....Magnetic tape 2" wide

	50 Field	60 Field
Tape Speed	15.6 in. (39.7 cm)	15 in. (38.2 cm)
Picture-Sound Separation	14.8 frames sound leading	18.5 frames sound leading
Recording Time	92 min. on a 14 in. reel (7200 ft.)	96 min. on a 14 in. reel (7200 ft.)
Rewind Time	Approx. 5 min. for 7200 ft. reel	Approx. 4 min. for 7200 ft. reel

Recording Time Reference.....To incoming video signal or an external reference

Playback Time Reference.....To the power line or to an external reference

Stopping Time.....Less than .2 seconds from Record or Play mode

Start Time for Stabilized Picture and Sound
(tone wheel mode).....Less than 5 seconds from Stop, less than 2 seconds from Setup or Standby
(Pix Lock mode).....Less than 5 seconds from Stop

Tape Interchangeability.....Tapes made on any machine may be played back on any other machine providing they are made in accordance with all applicable proposed SMPTE recommended practices and proposed ASA standards.

Tape Timer.....Accumulated time measured in minutes and seconds. Accuracy within 3 seconds per hour

Horizontal Displacement of Vertical Aligned Picture Elements.....Not to exceed .02 microseconds at junction points

RF Limiting.....Sufficient to allow RF signal level into the demodulator to be 55 db below nominal before video signal is affected by a 10 percent reduction in level.

Signal Levels

Input Signal Requirements:

VIDEO.....Input signal level may be between .5 volt p/p and 1.4 volts p/p composite signal; signal may be looped through or terminated in 75 ohms.

AUDIO.....Line input level between 0 and 36 dbm, 600 ohm balanced or unbalanced (Recorder may be wired for 150 ohm balanced or unbalanced or 5000 ohm bridging).

CUE.....Same as Audio above

SYNC.....Negative polarity 3 to 5 volts p/p

COLOR SUBCARRIER.....1.5 to 2.5 volts p/p bridging or 75 ohm terminated

RF COPY.....1 volt p/p nominal 75 ohm terminated

Output Signal Availability:

VIDEO (Monochrome or Color)
Three Line Outputs: one composite or non-composite
Two Monitor Outputs: composite
Video Level: .5 to 1 volt p/p; Sync Level: .2 to .4 volt p/p
Pedestal Level: ±20% of video level
Burst Level: .2 to .4 volt (color only)
Chroma Level: ±20% of nominal (color only)

AUDIO.....One Line output: +18 dbm maximum into 150/600 ohms balanced or unbalanced line
One Monitor output: +40 dbm maximum level into 8/16 ohm load (10 watts)

CUE.....Same as Audio above

SYNC.....3.5 to 5 volts p/p standard EIA sync signal

RF COPY.....1 volt p/p level, 75 ohms terminated

Electrical

Power Requirements
60 cycle.....117 volt a-c ±10% single phase 2 kw
50 cycle.....234 volt ±10% single phase 2 kw

Frequency Response:
Video Channel.....Monochrome—405/525 ±1.5 db 30 cycle to 4 mc; 625/819 ±1.5 db 26 cycle to 5 mc
Audio Channel.....(at 15 ips) ±2 db, 50 to 15,000 cycles
(at 7½ ips) ±2 db, 60 to 10,000 cycles
Cue Channel*.....(at 15 ips) ±2 db, 50-10,000 cps
(at 7½ ips) ±3 db, 60-10,000 cps

Signal-to-Noise Ratio:
Video.....On an interchangeable tape basis; 4 db pre-emphaasis
405/525 line.....Better than 40 db (37 db at 7½ ips)
625/809 line.....Better than 37 db (34 db at 7½ ips)
Audio.....Better than 55 db, measured overall between a recorded level corresponding to 3% total rms distortion at 1000 cycles per second and noise present when playing back an erased unmodulated tape
Cue.....Better than 34 db, measured overall between a reference 5% record level and the noise present when playing back an erased, unmodulated tape

Transient Response.....Rise time less than 0.15 μsec. overshoot less than 12% on 0.062 μsec. sine-squared window test pattern

Ambient Temperature and Humidity.....Between 35° and 110° F. (0° to 45° C) at 20 to 90% relative humidity

Picture Jitter.....With recorder in pixlock mode using air bearing headwheel assembly, picture jitter should not exceed ±.07 microseconds

Wow and Flutter.....0.5 to 250 cps range
(15 ips) 0.15% or less RMS
(7½ ips) 0.25% or less RMS

Mechanical

Transport.....Centrally located at 45° angle and at a reel height of 48" (112 cm)

Dimensions: Width (overall) 55" (140 cm), Width (Less End Panel) 53" (134 cm), Height 71¼" (181 cm), Depth 26½" (67 cm)

Shipping Information: Width 61¼" (155.5 cm), Depth 35" (88.8 cm), Height 84" (213 cm), Volume 125 ft.³ (3.75 M³), Gross Weight 1560 lbs. (708 kg)

* Includes 36 db notch at 240 or 250 cps, automatically switchable for 50 or 60 cycle standards.

Ordering Information

The Type TR-22D TV Tape Recorder is available for operation on 525, 625, 405 and 819 line tv standards.

Two basic models are available:

(1) a 525 line machine

(2) a switchable machine for 525/625/405 or (optional 819) line operation

They may be ordered as follows:
525 line, 60 cycles, specify ES-43560
525/625/405 line, 50 cycles, specify ES-43561-405
525/625/819 line, 50 cycles, specify ES-43561-819

All models include the following equipment complement:

1 TV Tape Recorder (Console Mounted) complete
1 Headwheel Panel Assembly (Air-bearing)
2 End Panels
1 Kit of Maintenance Materials
1 Monochrome Video Alignment Tape

RCA RADIO CORPORATION OF AMERICA

PRINTED IN U.S.A.

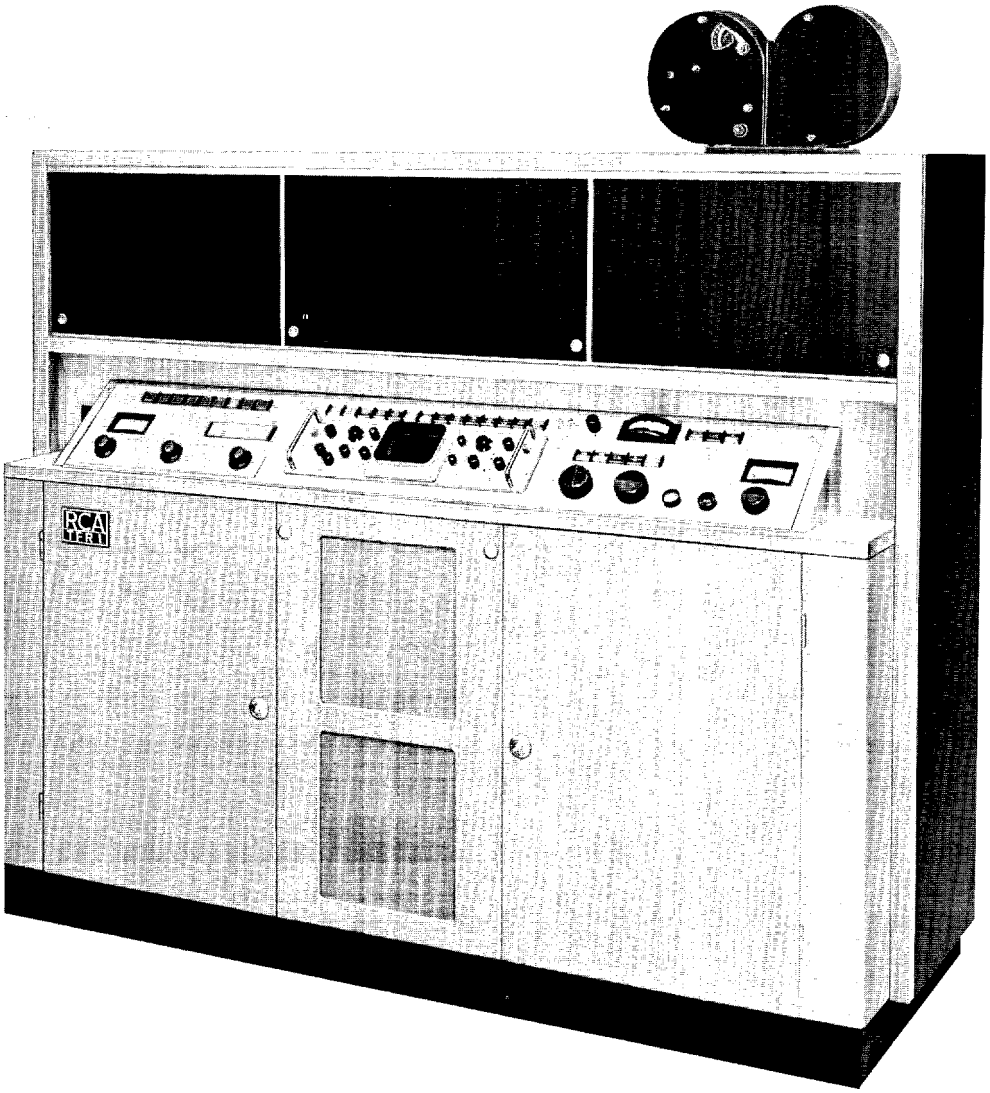
BROADCAST AND COMMUNICATIONS PRODUCTS DIVISION, CAMDEN, N. J. 08102 • RCA INTERNATIONAL DIVISION, CENTRAL and TERMINAL AVENUES, CLARK, NEW JERSEY, U.S.A. 07066

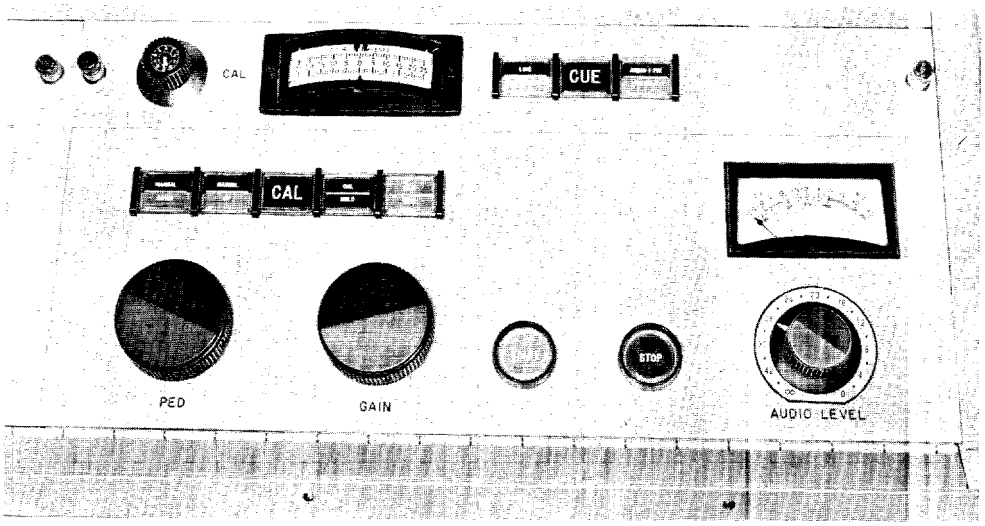
[redacted] 25X1

catalog R.4120 [redacted] 25X1

Price

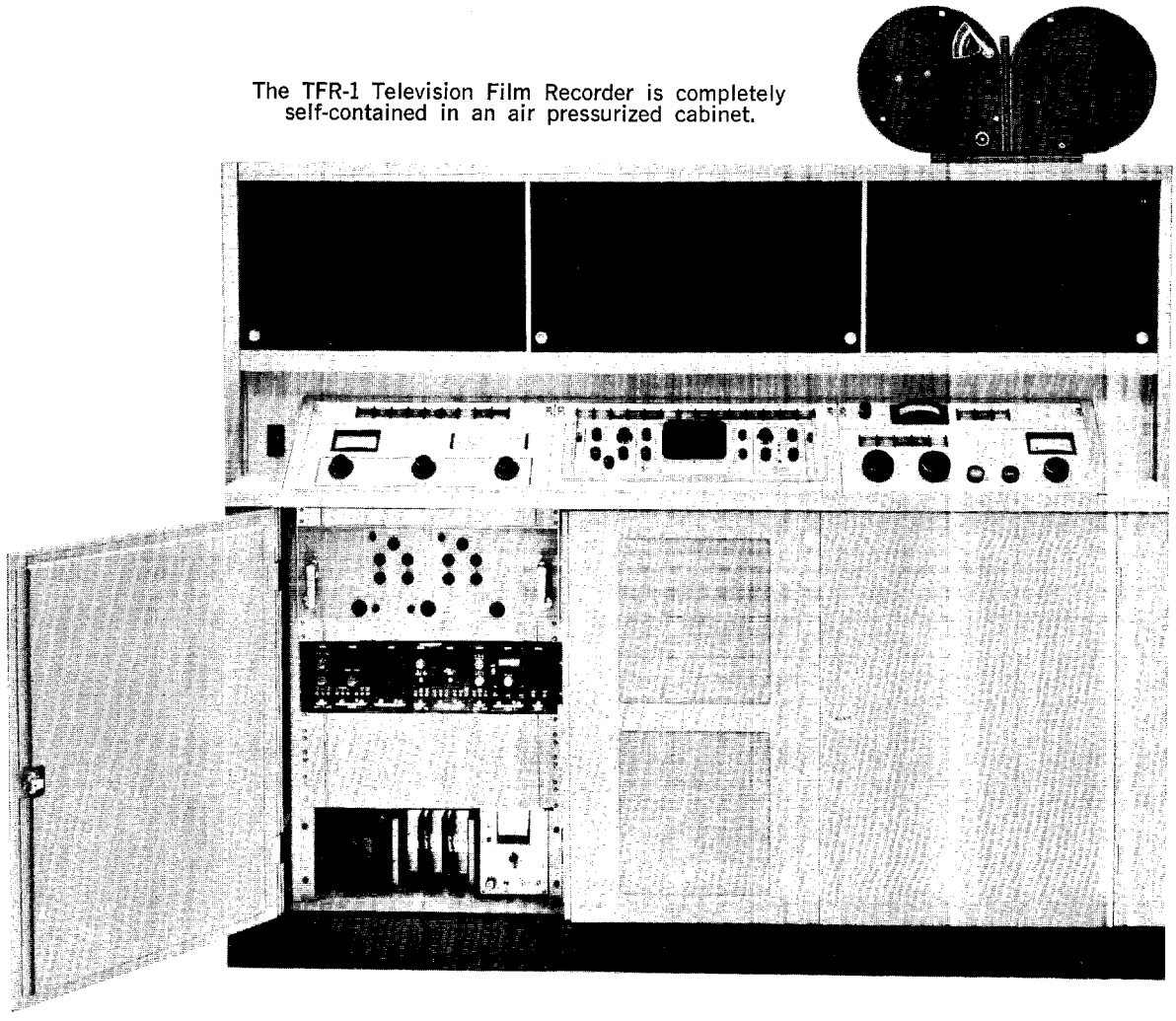
Television Film Recorder,





For ease of operation, the control panel of the TFR-1 is divided into three functional areas. Illustrated above is the right hand control panel, located beneath the camera.

The TFR-1 Television Film Recorder is completely self-contained in an air pressurized cabinet.



Television Film Recorder, Type TFR-1

The RCA Type TFR-1 Television Film Recorder produces consistently high quality 16mm motion picture films from television signals. Video signals fed to the equipment appear on a high-resolution image display tube (kinescope), and in turn are recorded on film by the camera. The TFR-1, used in conjunction with a 4½-inch image orthicon camera, can produce a high quality noise-free film recording that is virtually indistinguishable from a "live" pickup.

The TFR-1 offers the opportunity for broadcasters and others with TV studio facilities to establish a film center for the production of commercials, delayed network programs, promotional films, public service films and the like, either for distribution or for library inventory.

Once the information is recorded on film, one, ten, or more copies can be readily obtained at far lower cost than other media to support varying distribution requirements. Recorded material may be easily checked and edited prior to further duplication.

As a result of its automatic preset exposure parameters which can be obtained at the touch of a button, this recorder will produce consistently good quality film transfers. A complete line of accessories, including single or double system optical sound recording channels, enhances its adaptability to a wide range of film recording requirements.

TFR-1 Film Recorders can be furnished to meet CCIR standards and can be equipped with 35mm cameras, if required.

Description

The Type TFR-1 Television Film Recorder utilizes new design concepts in the image display tube and recording camera which account for a large portion of the improvements in the recording process. These components, together with an electronic system that provides minimum operating controls, optical "feedback" of output and control of both contrast and brightness of the display image, make the TFR-1 the first film recorder in the industry which can be called "automatic."

Self-Contained Console

The TFR-1 equipment is completely enclosed in an air-pressurized cabinet. It consists basically of the image display tube and camera, together with associated control panel, video amplifiers, deflection circuits and power supplies. Electronics for the system are housed in the base of the recorder. The sloped control panel includes the waveform monitor and meters, and is divided into three functional areas for operating ease.

Maximum accessibility is afforded by swing-out door panels, plug-in modules and shelves. The top portion of the cabinet houses a floating optical bench on which is mounted the image display tube and the camera. Access to this area is provided by means of sliding panels.

An a-c circuit breaker is provided and power input is by means of a single cable power feed. An ordinary 3-connector twist lock receptacle is used for supplying power.

Simplified Control System

The TFR-1 is designed for ease of operation and maintenance. The control panel is divided into three functional areas. The left hand panel contains illuminated pushbutton indicators and a meter for checking significant voltages, waveform monitor input pushbuttons and centering and focus controls.

The center panel contains the waveform monitor and illuminated function selector pushbuttons. The mode of operation, i.e., positive or negative, aperture compensation for live or tape signals, scan reversal, etc., is selected on this panel.

The right hand control panel, which is located beneath the camera, is the operating panel containing start-stop buttons, calibrate buttons, pedestal and gain controls, VU meter and audio level control. A calibrated dial provides adjustable reference for the light output of the image display tube.

To produce consistently high quality motion picture films, accurate control of exposure is necessary. In the TFR-1 system this is achieved by means of a photo-cell bridge which automatically adjusts both black level and contrast range to preset values at the touch of a button.

Sub-Screen High Resoluion Display Tube

The TFR-1 utilizes a specially designed image display tube which incorporates a precision aligned electron gun with controlled spot size for optimum resolution at all normal brightness levels. Electrostatic focus with the addition of "Dynamic Beam Focusing"—the mixture of several focusing waveforms—results in optimum resolution capabilities in all raster areas.

This image display tube's high resolution capability (at least 800 lines in the center of the raster and at least 600 lines in the corners) results from a special electron gun structure which provides a 3 mil spot size (comparable to writing with a fine pencil). The sub-screen tube utilizes a method of phosphor suspension that permits the image to be located a short distance behind the face plate. Dispersion of light caused by the thick face plate is thereby virtually eliminated. This also allows an effective increase in detail contrast ratio.

Precision Registration Camera

The TFR-1 system includes a 16mm recording camera specifically designed for film recording. This camera features simplicity of operation, virtually vibrationless mechanism, and fixed registration pin for precise frame registration. The pull-down principle employed uses only one reciprocating component. Pull-down is accomplished without the use of claws. The optical shutter is based upon a "lap-dissolve" action which effectively eliminates shutter bar effects. The TFR-1 camera, combined with the image display tube featuring PTFR-3 phosphor, produces film transfers of consistent excellence.

Synchronous Camera Drive System

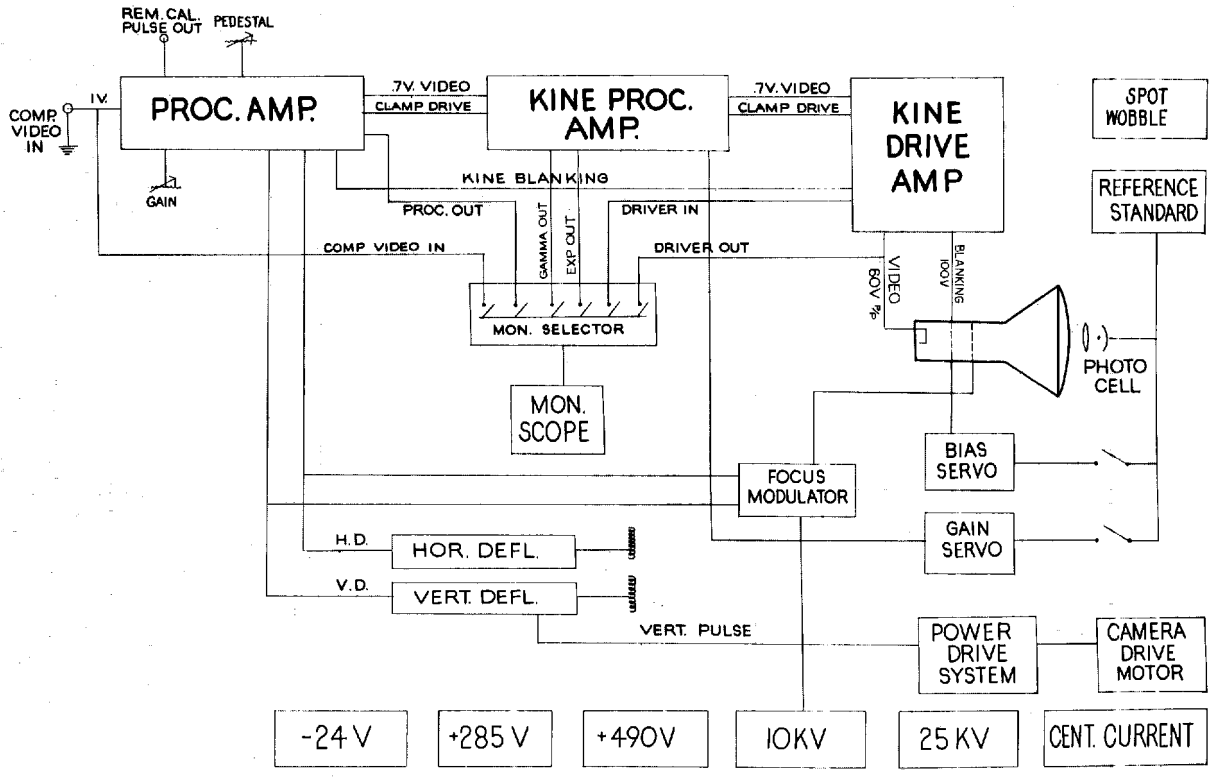
A solid state power drive system driven by the vertical deflection chassis assures synchronous operation of the camera, locked to the incoming video signal at all times.

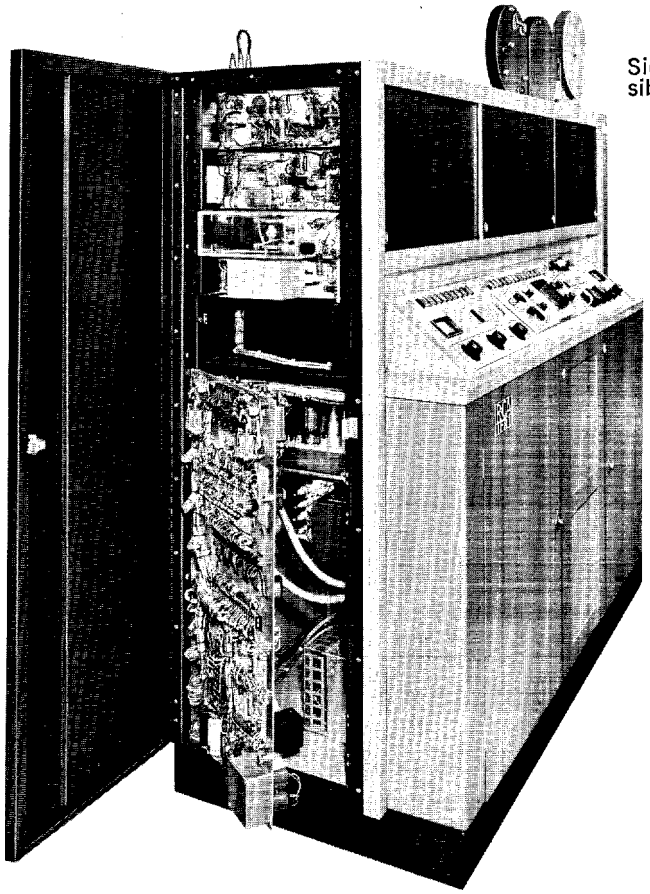
This is a vital factor in the outstanding flexibility of the TFR-1. Any incoming video signal—color or monochrome, local or remote—can be faithfully recorded without shutter-bar effects that result from non-synchronous operation.

The Electronic System

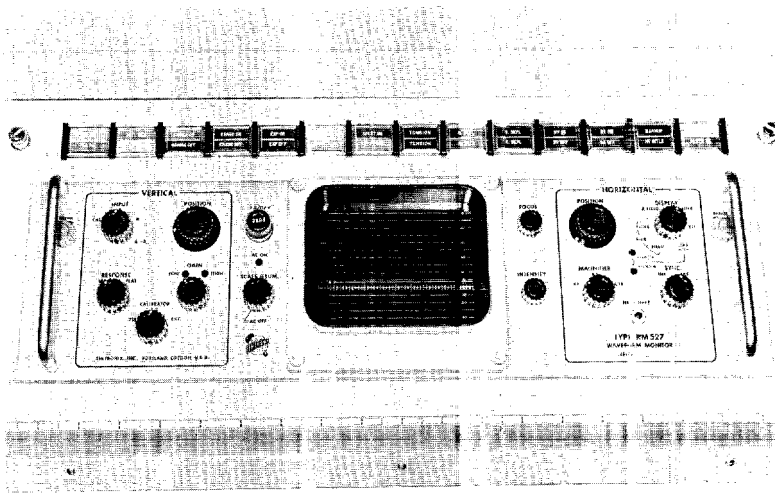
The electronic system of the TFR-1 is shown in the block diagram. The first block in the system

Block diagram of TFR-1 Electronics System.





Side view of TFR-1 showing accessibility of electronic components.



Initial set-up and adjustment of the TFR-1 is available by a built-in waveform monitor with pushbutton input selectors.

is a processing amplifier which separates the sync, drive and blanking information from the composite signal for use throughout the system. Added to the processing amplifier is a calibration pulse generator which plays an important part in the system operation. It produces a half black and half white screen presentation on the display tube which is referenced to an established standard, for automatic adjustment of gain and bias to produce the desired brightness and contrast.

The generator is also used as the signal source to automatically produce a 4 step variable density strip after each set up for laboratory processing guidance. The steps vary in amplitude from zero to the established maximum, with each step representing an equal increment of the total maximum brightness value. Thus a sensitometric reference at the beginning of each film is available for processing laboratory use.

A precision clamp and level reference pulse is generated, always available, mixed with the signal for purposes of clamping and level control during horizontal blanking to a predetermined level on either positive or negative picture presentations. A clamp driver is added with variable timing to provide clamp on either reference black or reference white depending upon which display is desired—Negative or Positive.

Kine Processing Amplifier

The kine processing amplifier contributes several essential functions to the systems concept: aperture compensation, exponential correction, gamma correction and system gain. Aperture compensation is variable in amplitude over a range of 10 db, with pushbutton selection for two frequencies (4 and 8 megacycles) for the purpose of tape and live recordings respectively.

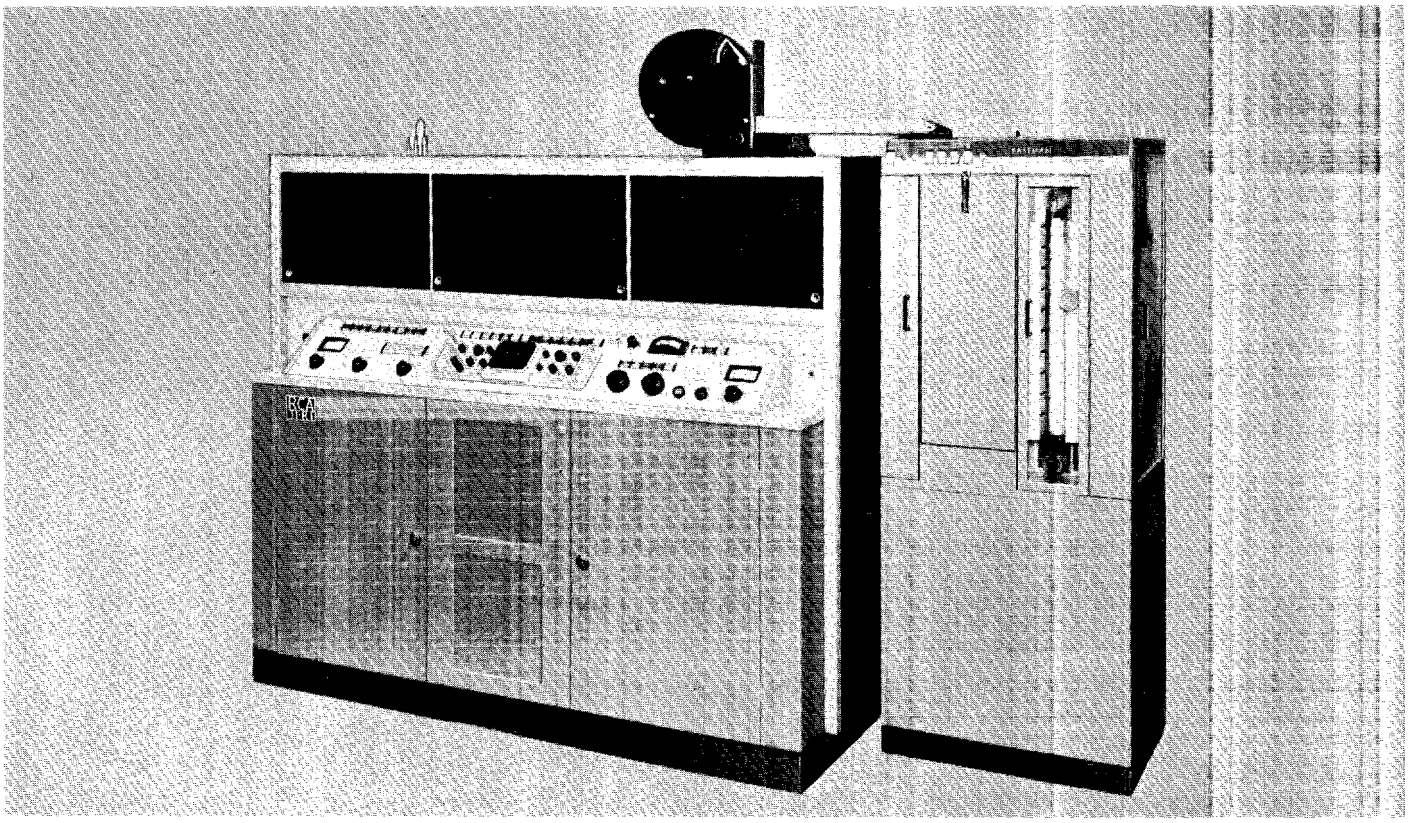
Exponential correction ("white" stretch) and gamma correction ("black" stretch) are provided to permit precise control of the video to luminance transfer characteristic. Both negative and positive film recordings can be optimized through the use of continuously adjustable slope and break point controls for exponential and gamma. If desired, both circuits can be by-passed by front panel pushbuttons. The kine processing amplifier also controls the system gain as determined by the automatic calibration circuit.

A kine driver amplifier follows. It is a high gain video amplifier providing 60 volts peak-to-peak from 30 cps to 8 mc within ± 0.5 db and to 10 mc ± 1.5 db. The amplifier is directly coupled to the cathode of the display tube, with d-c restoration of the feedback clamp type. The amplifier also increases kine blanking to 100 volts for "super blanking."

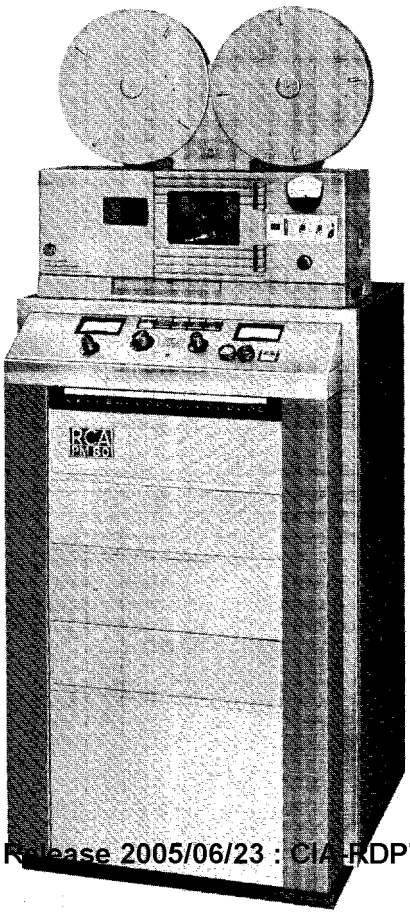
Built-In Waveform Monitor

The TFR-1 Television Film Recorder contains a waveform monitor with pushbutton input selector. The pushbuttons are arranged so that the signal path may be sequentially monitored from input jack to image display tube. This allows a rapid method of initial set-up and adjustment of the system as well as a convenient tool for normal maintenance of the system.

Illuminated pushbutton switches are employed for almost all operating and set-up functions. Critical components, such as the image display tube, are protected by various electrical interlocks to protect these components from accidental damage due to circuit failures or other causes. High voltage interlocks for personnel protection are also provided.



Automatic Film Processor, available as a TFR-1 accessory, produces high quality films in a continuous automatic process without need for mixing chemicals or preparing solutions.



PM-80 Double System Optical Sound Recorder is available for applications where it is desirable to have separate processing for the sound portion of the film. It includes transistorized amplifiers and employs the proven RCA variable area recording method.

Automatic Presetting Exposure Control

An important element of the TFR-1 system is the automatic calibration circuit which provides repetitive accurate set-up of the recording channel. During the calibrate interval the calibration pulse generator previously described provides a screen presentation of half white and half black. A photo cell scans the presentation and compares the luminance values observed to the established standard and sequentially causes the bias and gain servos to adjust the brightness (bias) and contrast (gain) to achieve the pre-set operating conditions.

Dynamic Beam Focusing

The focus modulator provides adjustable amplitude hyperbolic wave forms at horizontal and vertical rates to produce excellent spot focus over the entire face of the display tube. Also, the circuits are designed to compensate for the defocusing effect produced by the wide range of video drive, maintaining the desirable spot size throughout all normal operating conditions.

Solid State Power Supplies

The power drive system for the camera is a solid state device that powers the camera motor, directing its speed and phase in accordance with the timing of the television picture. Thus, it operates independently from the a-c power line frequency. This is most necessary when working at color standards (59.94 cps) and further advantageous for all tape transfer work.

All power supplies including filament supplies are regulated and the horizontal and vertical deflection chassis are also highly stabilized with excellent linearity.

Line Erase

A "spot wobble" modulator drives an auxiliary yoke winding and is controlled by a front panel push-button. With line erase "on," the raster lines are effectively eliminated from the recorded film by a very high frequency modulation of the kinescope beam. This is accomplished with no discernible loss in picture resolution.

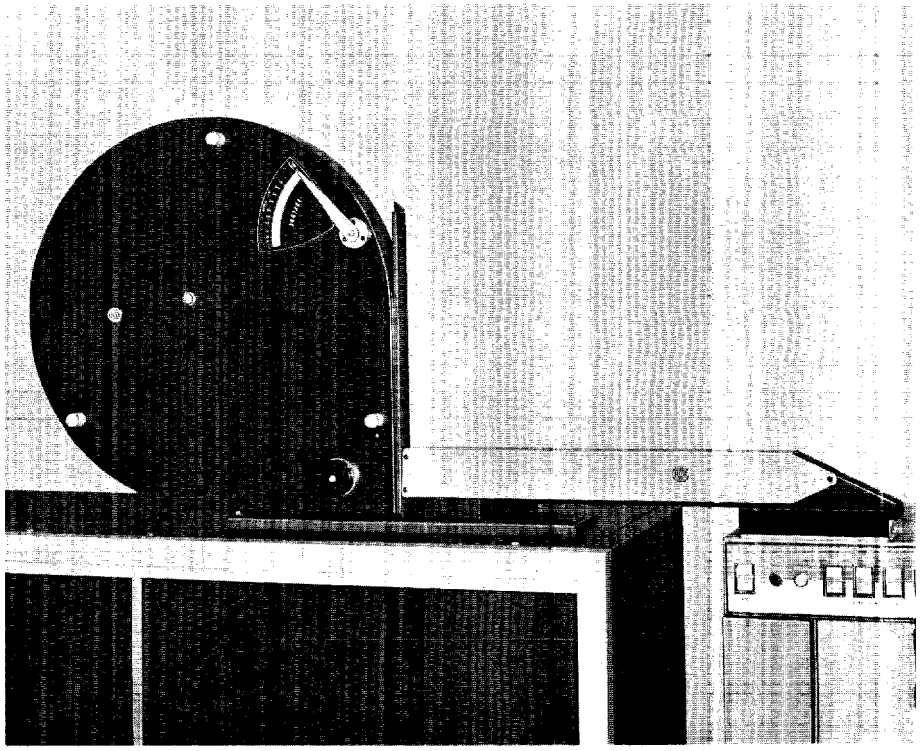
Automatic Fault Indicator System

A color code is employed on the illuminated buttons so that a "red" indication points out an inoperative circuit or unit. Under normal operation all indicators will show either yellow or green. Secondary circuitry such as aperture compensation, gamma correction, exponential correction, etc. may be bypassed at the touch of a button to prevent a complete loss of the recording in the event of circuit failure.

Built-In Test and Reference Signal Generator

Three test and reference signals are generated in the TFR-1 to facilitate controlled, automatic operation:

1. A half-black half-white presentation on the image display tube serves as the basis for automatically adjusting gain and bias to pre-determined levels as previously described.
2. A constant amplitude calibration pulse appears in the horizontal blanking interval during normal operation of the recorder and establishes peak video level.
3. A 4 step test signal is generated after each calibration cycle to serve as a reference for film processing.



The MI-29733 Coupling Unit, for use between recorder and processor, automatically starts and stops TFR-1 and processor at required time intervals.

ACCESSORIES

Single System Variable Area (Auricon) Optical Sound Recording Accessory Kit.....MI-29736-VA

Single System Magnetic Sound Recording Channel....MI-29738

Single System Variable Area (Maurer) Optical Sound Recording Channel.....MI-29744

RCA Type PM-80E Double System Optical Sound Recording Channel.....ES-40968

Power Drive System for PM-80E including Interconnecting Cables and Accessories.....MI-29737

1200-foot capacity 16mm Film Magazine.....MI-10770-E

MacBeth Model TD-100 Densitometer

Eastman Model 30 Viscomat Processor

Eastman Model 1M, Viscomat Water Temperature Control Unit

Coupling Unit, with start-stop sequencer (for use between recording camera and viscomat processor) MI-29733

Electrical

Input Signals:
- Video:
  - Composite Video Signal.....In accordance with EIA and FCC specified color/monochrome signal standards
  - Composite Video Signal Level.....0.5 to 1.4 volts peak-to-peak
- Audio (optional).....−10 to +8 VU into 600 ohm balanced line matching input
- Power.....117 volts ±10%, 60 cycles a-c single phase, 13 amp. (ES-40967)
  230 volts ±10%, 50 cycles a-c single phase, 7 amp. (ES-40967-B)

Performance

General:
- Recording Medium....16mm double or single perforated blue sensitive film such as Eastman 7374
- Film Speed:
  - ES-40967.....24 frames per second
  - ES-40967-B.....25 frames per second
- Picture—Sound Separation.....26 frames, sound leading
- Recording Time.....Nominally 66 minutes
- Starting Time.....3 seconds maximum

Camera

Fast-film pull-down mechanism
Buckle trip interlock
2400 ft. film capacity
Fixed registration pin
Viewing magnifier for lineup
Separate torque motor for magazine drive
Film footage counter

Image Display Tube

- Diameter.....9″
- Raster Size.....4.2″ by 5.6″
- Deflection.....Electro-magnetic
- Focus.....Electro-static
- Phosphor.....PTFR-3
- Resolution.....800 lines
- Spot Size.....003″ max.

General Specifications

- Deflection System.....Linearity deviation 1% max.
- High Voltage Supplies.....25 KV ±1%, 10 KV ±1%
- Control System:
  - Exposure Control.....Photocell Bridge coupled to servo potentiometers
  - Brightness Reference.....Comparison voltage
  - Contrast Reference.....Selected Wratten Neutral Density Filters
- Auxiliary Circuit Selection.....Illuminated Pushbuttons
- Metering Selection.....Illuminated Pushbuttons
- Mode Selection.....Illuminated Pushbuttons
- Calibrate Presets.....Illuminated Pushbuttons
- Video Amplifier Bandwidth.....±.5 db to 8 mc
- Aperture Correction.....Approx. 4 mc and 8 mc
- Boost.....Adjustable to 10 db min.
- Gamma Correction.....Two breakpoints, adjustable Two slope gain controls
- Exponential Correction.....Two breakpoints, adjustable Two slope gain controls (Provision for five plug-in units)

Mechanical Specifications

- Width.....70″
- Height (not including film magazine).....60″
- Depth.....26″
- Shipping Weight.....1200 lbs. (approx.)
- Finish.....Two tone blue

Ordering Information

Type TFR-1 Television Film Recorder.....ES-40967
525 lines, 60 fields, including:
1 MI-29730 Console Assembly
1 MI-29732 Recording Camera
2 MI-29734 Film Cassette (2400 ft.)
1 MI-29739 Footage Counter
1 MI-29813 Image Display Tube (Subscreen)
1 MI-29814 Image Display Tube

Type TFR-1 Television Film Recorder.....ES-40967-B
625 lines, 50 fields (CCIR) including:
1 MI-29730-B Console Assembly
1 MI-29743 Camera
2 MI-29734 Film Cassette (2400 ft.)
1 MI-29813 Image Display Tube (Subscreen)
1 MI-29814 Image Display Tube

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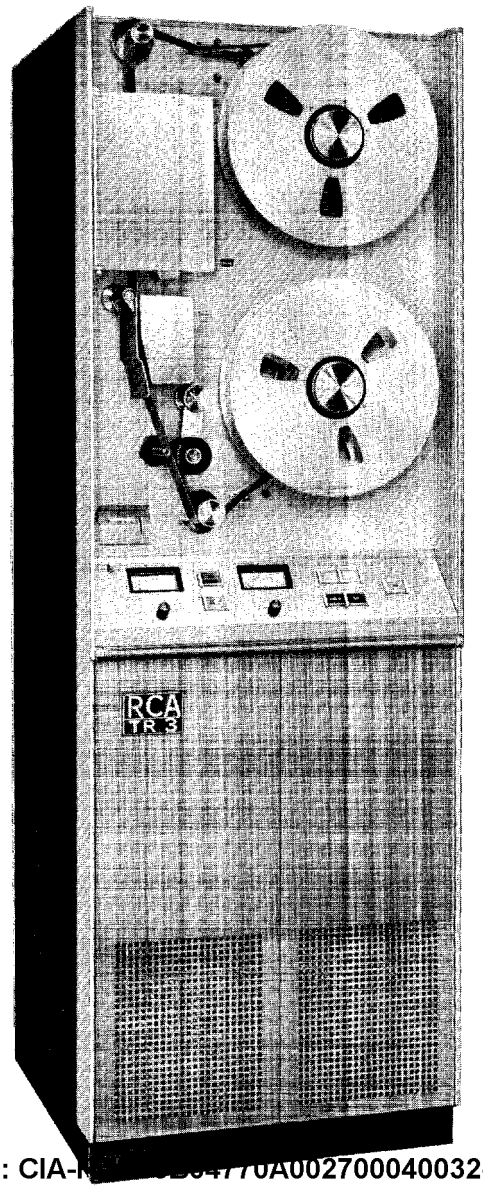
TRADEMARK(S) ® REGISTERED MARCA(S) REGISTRADA(S)

catalog B.7010

Recorder

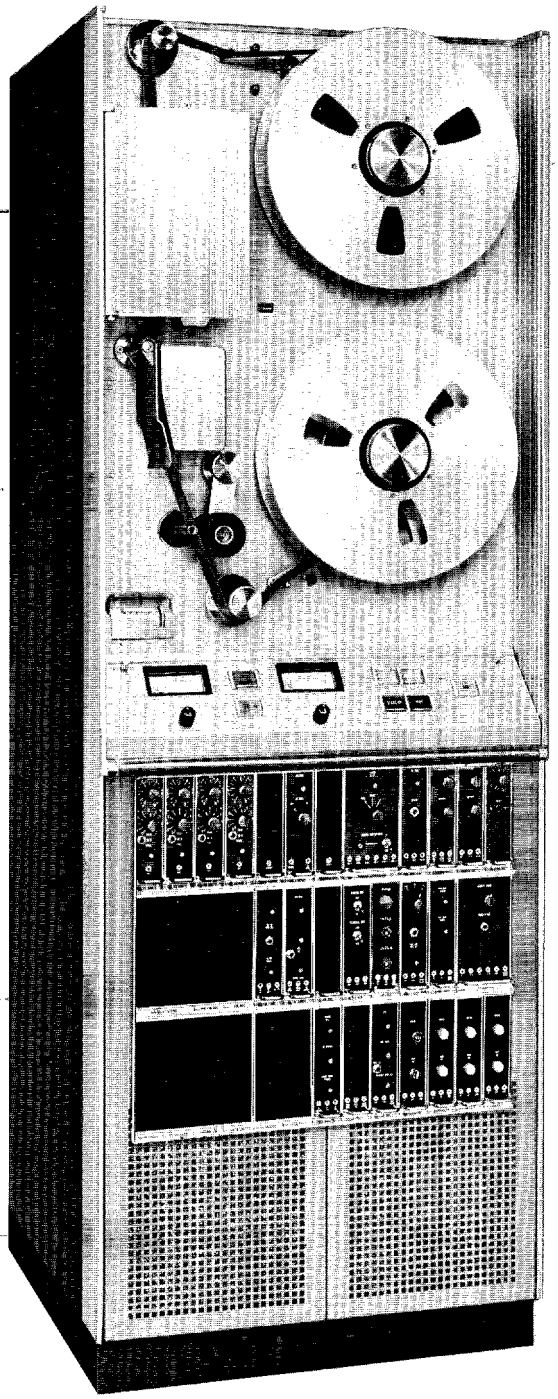
TV Tape Player, Type TR-3

- For on-air or closed circuit presentations
- Plays all standard TV quadruplex tapes
- Expandable to include recording function



TV Tape Player

For All Standard Quadruplex Tapes



Compatible with All Standard Quadruplex Recorders

For Screening or On-Air Playback

Switchable Standards (50-cycle model)

Occupies Less Than 4 Square Feet of Space

Uses Standard 12½-inch Reels

Convenient and Simplified Operating Controls

Transistorized Modular Construction

Built-in Pixlock

Available Accessories:

- **Automatic Timing Corrector**
- **Color ATC**
- **High-Band Capability**
- **Air Bearing Conversion**
- **Monitor Accessory**
- **Record Accessory**

Approved For Release 2005/06/23 : CIA-RDP78B04770A002700040032-5

TV Tape Player, Type TR-3

The RCA TR-3 TV Tape Recorder provides an economical means for playback of television tapes. It plays both color and monochrome tapes for either broadcast or closed circuit use. Its operation may be considered similar to a film projector. In the same way that projectors are used to screen films, this player is used for screening of tapes. It is a compatible machine designed for playback of all TV tapes made on quadruplex recorders to broadcast standards. This player may be converted to a complete Record/Playback machine by adding an accessory cabinet.

Description

The TR-3 TV Tape Player is engineered to reproduce faithfully the fine quality pictures now provided by the latest television cameras and recorders. It conforms with industry standards for playback of monochrome or color video signals.

New Look Emphasized

The TR-3 is a "new look" equipment from RCA. Advanced design techniques including transistorization, modularization stabilization and standardization are achieved. Transistorized circuits in modular form are used throughout. Operational stability that readily permits semi-automatic "pre-set" operation and remote control frees operators from constant attention and frequent adjustments. Many of the modules of the TR-3 are interchangeable with those of other tape recorders. Such standardization reduces cost, makes quick replacement easy and operation less confusing because equipment arrangements and set ups are similar.

Quality Performance

Careful design has resulted in a self-contained player whose performance meets professional broadcast standards. It is compatible with all standard quadruplex television recorders. It meets rigid specifications to assure top performance. Features include built-in two-speed, switchlock and pixlock operation.

Switchable Standards

The TR-3 is available in 50 and 60-cycle models. The 50-cycle model is equipped for operation on international standards. To change from one standard to another, the operator merely moves the standards selector switch to the desired position. This master circuitry provides instantaneous switchover from 525 to 625 to 405 TV line standard.

Built-in Two-Speed Operation

Circuits to permit choice of operating speeds, 15 or 7½ inches per second, are built into the TR-3. Playback time of up to 60 minutes at 15 IPS or 120 minutes at 7½ IPS is possible with the 12¼-inch tape reels.

Pixlock

The Pixlock system accurately synchronizes vertical sync and horizontal sync pulses derived from television tape signals with the vertical and horizontal sync pulses provided by the station's local sync generator. This makes possible fades, wipes, dissolves and special effects. Only a single operating control is required and maximum lock-in time is 3 to 5 seconds.

Interchangeable Modules

The modular construction of the TR-3 player means that many of the modules are interchangeable with the TR-4, TR-5 and TR-22 TV Tape machines. All modules are completely accessible and by means of a module extender it is possible to service the machine while in operation.

Advanced Styling

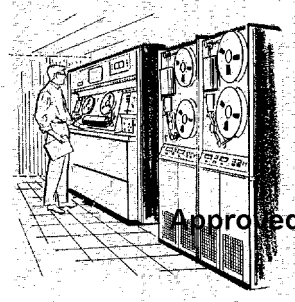
Advanced design techniques have resulted in significant reduction in size, weight and power consumption. The modern styled cabinet measures only 22 by 24 inches at the base and is 66 inches high. Weight is approximately 600 pounds. It can be readily moved on its built-in casters. Vertical construction requires less than 4 square feet of floor space.

Versatility

The TR-3 is a versatile supplement to the broadcaster's present TV taping facilities. Providing the same high quality as RCA de luxe machines, it is an additional source for on-air material. It may also be used for client previews and editing, relieving heavily scheduled recording equipment at relatively low cost. For agencies and station reps, the TR-3 provides a means for checking and presenting commercials to clients. It is a low-cost, highly-effective selling tool. For closed circuit users the TR-3 Player may be integrated into the system and used to present taped programs.

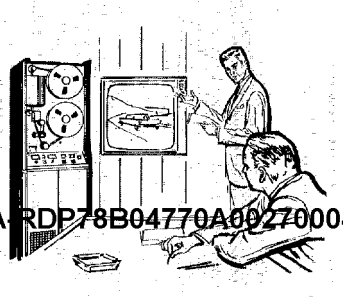
PLAYS BACK ALL QUADRUPLEX TAPES FOR A VARIETY OF APPLICATIONS

On-Air Broadcast

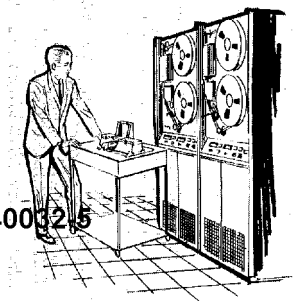


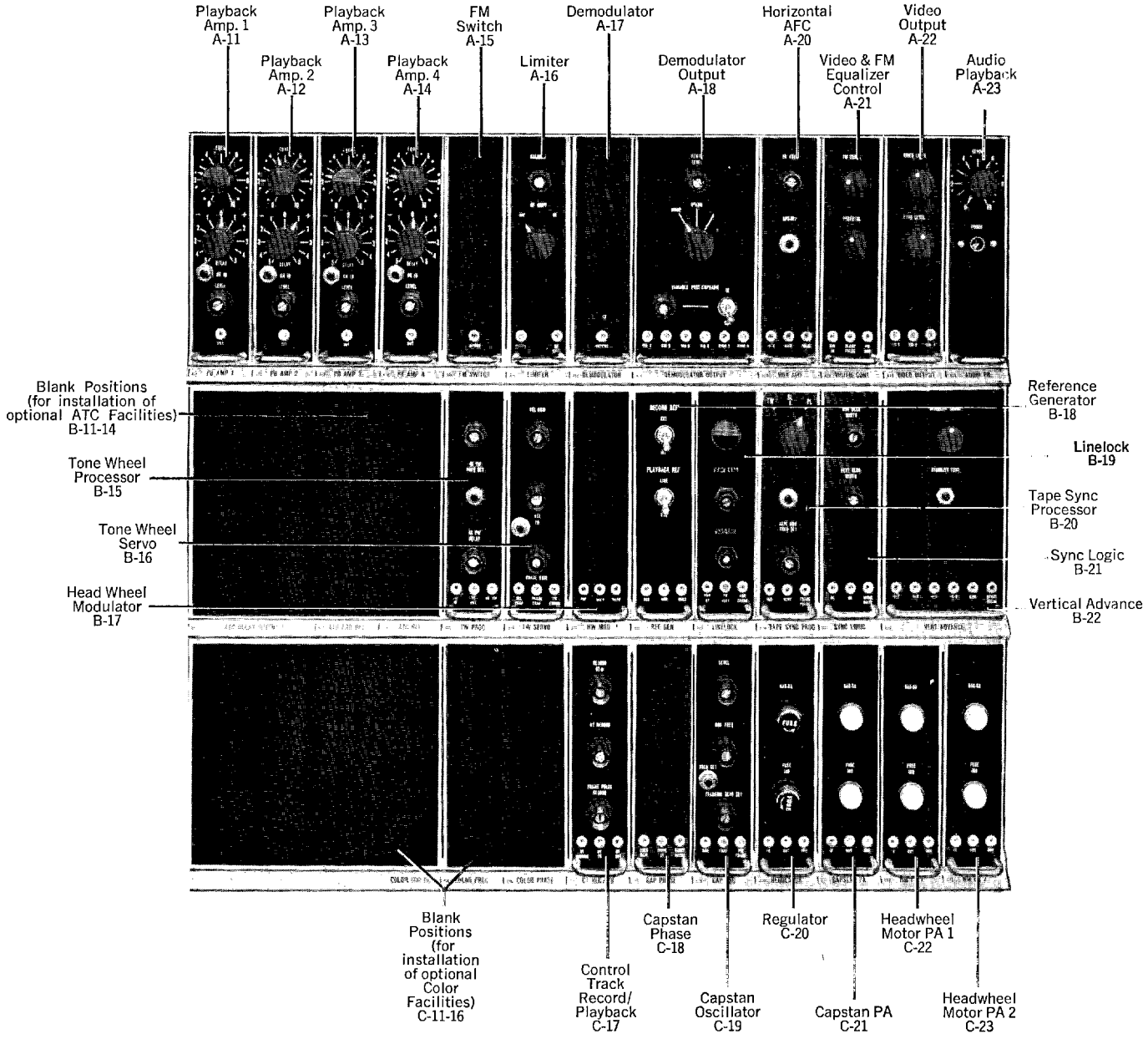
Educational TV

Previews and Presentations



Editing and Splicing





IR-3 Module Bank . . . Description of Functions

A11—Playback Amplifier #1
Provides gain, variable delay and equalization for channel No. 1.

A12—Playback Amplifier #2
Same function for channel No. 2.

A13—Playback Amplifier #3
Same function for channel No. 3.

A14—Playback Amplifier #4
Same function for channel No. 4.

A15—FM Switch
Switches between heads during playback, connecting the head scanning the tape to the output.

A16—Limiter
Provides approximately 55 db of limiting of the FM signal.

A17—Demodulator
Accepts signal from limiter. Contains output filter circuit.

A18 (A19)—Demodulator Output
Separates tape sync from tape signal and provides line drivers to feed unprocessed video to monitoring circuits and to processing amplifier. It also contains post emphasis circuit.

A20—Horizontal AFC
Tape Sync from the demodulator output is used to control frequency and phase of multivibrator. This, in combination with other circuits, generates a new horizontal sync, front porch, and blanking.

A21—Video and FM Control
Clamps the video and provides new blanking. Permits adjustment of pedestal level in outgoing video signal and adjusts overall FM frequency response to compensate for variations between video head assemblies.

A22—Video Output
One sending-end-terminated line driver distributes video within the machine. Three sending-end-terminated line drivers provide outputs from the machine.

A23—Audio Playback
Provides audio output to the program line and provides a jack for the headphone monitor.

B11 (B12)—ATC Delay and Output (Optional)
Space for this accessory equipment.

B13—ATC Error Detector (Optional)
Space for this accessory equipment.

B14—ATC Reference (Optional)
Space for this accessory equipment.

B15—Tone Wheel Processor
Shapes the tone wheel pulse and provides 960-cycle switcher drive.

B16—Tone Wheel Servo
Derives error signal controlling the headwheel motor in the tonewheel mode of operation.

B17—Headwheel Modulator
Amplitude-modulates the headwheel motor-drive sine waves. Gives wide-band, two-phase output for Scott-T transformer.

B18—Reference Generator
Processes local sync to produce horizontal-rate reference, field-rate reference, and frame-rate reference. The module also processes the 50/60-cycle power line reference.

B19—Linelock
Locks the machine to local horizontal and vertical sync signals to permit the use of special effects, fades, etc. Module includes automatic sensing to permit automatic drop-back to switchlock whenever the signal is interrupted.

B20—Tape Sync Processor
Processes tape sync to produce horizontal-rate reference, field-rate reference and frame-rate reference.

B21—Sync Logic
Generates horizontal and vertical blanking; combines them into composite blanking. Combines tape sync and regenerated horizontal sync into composite regenerated sync. Generates a start pulse which phases the counting of the vertical advance circuitry.

B22 (B23)—Vertical Advance
Special circuitry counts out number of pulses in a field to accurately determine position for regenerated vertical blanking. It includes 3-position standards switch in switchable standards model.

C11 thru C16—Color ATC (Optional)
Accommodate Color ATC Accessory.

C17—Control Track Record/Playback Amplifier
The 240-cycle control track signal is amplified, filtered to produce clean 240-cycle sine wave, clipped, and shaped into a pulse.

C18—Capstan Phase
The preceding pulse feeds a chain of binary counters which divide the pulse frequency by eight to produce a 30-cycle output pulse.

C19—Capstan Oscillator
A phase detector which compares incoming pulse to local frame pulse and produces a dc voltage proportional to magnitude of the phase error. DC error voltage controls frequency of the oscillator which supplies the drive frequency for the capstan motor. Tape speed is thereby synchronized to local reference.

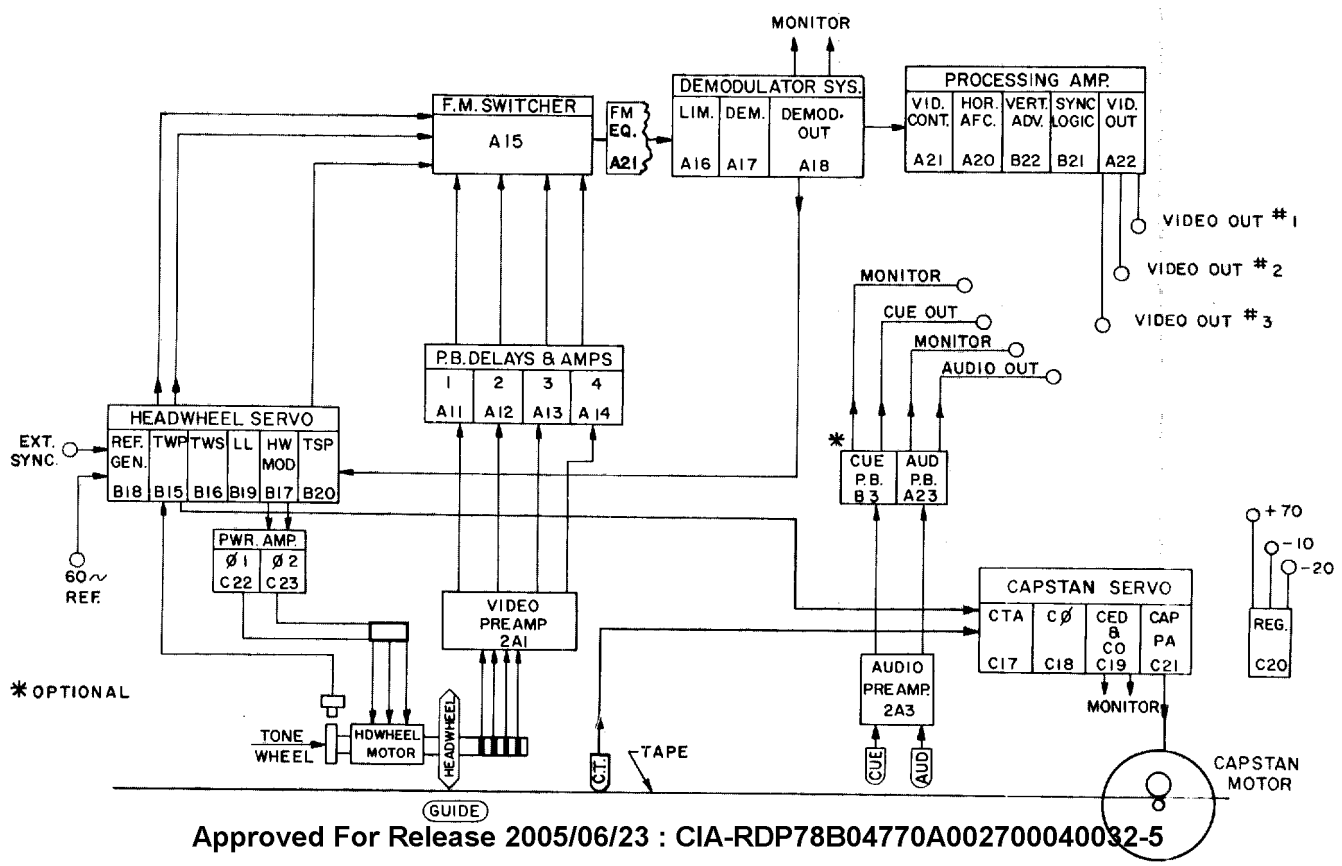
C20—Regulator
Provides regulated voltages to operate the transistor circuitry of the machine.

C21—Capstan Power Amplifier
PA for the capstan motor.

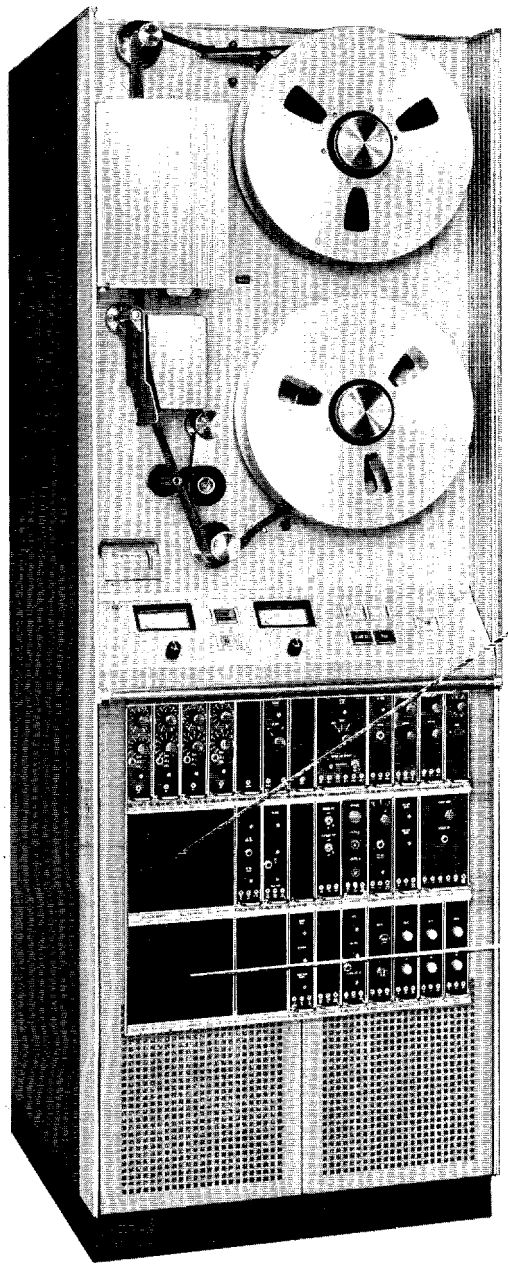
C22—Headwheel Motor PA #1
Provides power to drive one phase of the Scott-T transformer which in turn drives the three phase headwheel motor.

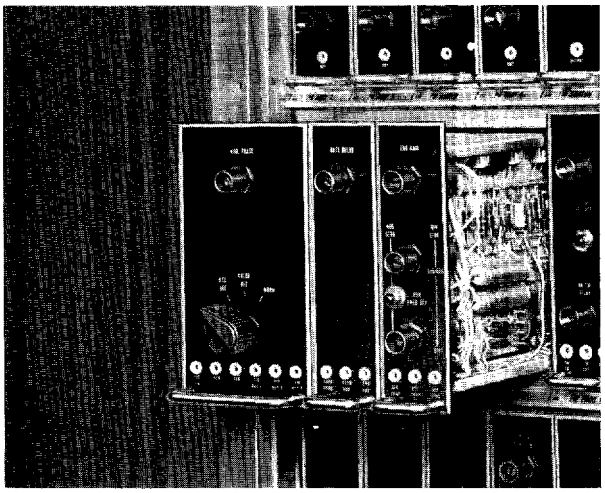
C23—Headwheel Motor PA #2
Provides power to drive one phase of the Scott-T transformer which in turn drives the three phase headwheel motor.

FUNCTIONAL DIAGRAM



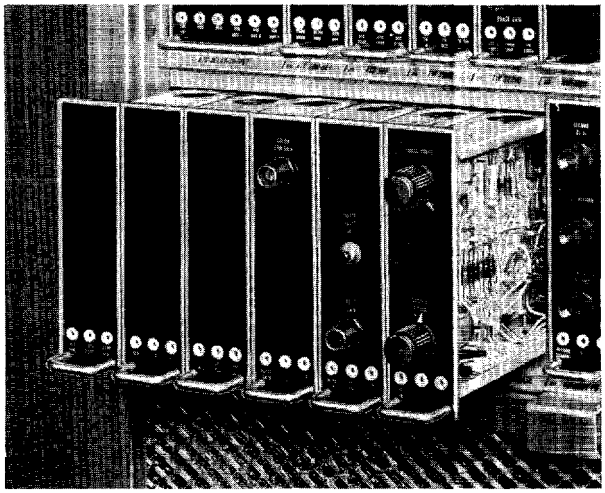
Plug-in Modular Accessories for every playback requirement





Automatic Timing Corrector

Color ATC



Major Accessories

Plug-In Modules

A full complement of Accessories is available for use with the TR-3 Player. These accessories are designed as transistorized plug-in modules. Space is provided for them in the Player.

ATC

The RCA Automatic Timing Corrector (ATC) is a transistorized video device that maintains near perfect picture geometry by automatically compensating for skewing, quadrature errors and scalloping. Its action is fully automatic. The ATC accessory operates with or without Pixlock. It thus serves as a continuous monitoring and correction device which automatically reduces the time delay errors occuring in the playback signal, thereby assuring the highest possible quality at all times.

The ATC equipment is supplied in kit form ready for installation in the TV Tape Player. The kit consists of a connector and cable assembly, three ATC plug-in circuit modules, a fixed delay line, ATC Relay Module and the parts required for installation. Installation of monochrome ATC allows color to be added by simply plugging in the Color ATC Modules.

Color ATC

The RCA Color Automatic Timing Corrector is designed to provide time base correction to the tape playback signal. It operates in conjunction with the monochrome ATC and pixlock servo system.

The Color ATC system comprises six transistorized modular units which plug into the module bank of the TR-3 and a plug in fixed delay line.

Stabilization is accomplished by measuring the residual jitter in a signal that has been pre-stabilized by the pixlock and monochrome ATC systems and eliminates the timing errors or reduces them to a negligible value, utilizing a time-error correcting circuit whose major component is an electronically variable delay line. Its output signal, which is directed to the signal processing amplifier, has less than ± 4 nanoseconds jitter and geometric distortion. As an adjunct to this stabilization process, the Color ATC removes old burst and inserts keyed local burst.

High-Band Capability

The TR-3 provides basic capability for later addition of High-Band, an accessory that provides maximum quality when using color and dubs made through the video tape system. This conversion is designed to virtually eliminate moire "beats" and significantly improve the video signal-to-noise ratio. Vast improvement of the "K" factor is also a significant by-product of high-band capability.

Record and Monitor Accessory

The addition of a MI-43361 Monitor Rack Assembly, and a MI-43360 Record Assembly will convert the TR-3 Tape Player into a complete TR-4 Compact Tape Recorder in a two step process that is easy on the budget, while allowing the continuous playback of video tape at a low initial cost. The MI-43361 Monitor Rack Assembly alone provides greater ease of maintenance as well as reduced setup time for refined servo adjustments.

Other Accessories

In addition, remote operation of both playback mode and signal can easily be provided by means of remote control panels. Attention is also called to the advantages of Air Bearing Conversion of Headwheel, Narrow Track Recording, and the convenient Video Alignment Tapes.

COMPLETE LIST OF ACCESSORIES

Monochrome Automatic Timing Corrector	ES-43580-A
Color Automatic Timing Corrector (TR-3 Color Conversion requires the ES-43580-A ATC accessory.)	ES-43582
High-Band Capability	MI-43358
Monitor Assembly	MI-43361
Record Accessory (The TR-3 Record Conversion Requires Monitor Assembly MI-43361.)	MI-43360
Remote Control Panel (Mode)	MI-40691
Remote Control Panel (Signal)	MI-40692
Air Bearing Conversion (less Air Bearing Headwheel Panel; For external mounting—includes Air Compressor)	MI-43365
Air Bearing Conversion (less Air Bearing Headwheel Panel; For external air supply—does not include Compressor)	MI-43364
Headwheel Panel Assembly (Standard Track Air Bearing)	MI-40790-A
Headwheel Panel Assembly (Standard Track Ball Bearing)	MI-40760-B
Headwheel Panel Assembly (Narrow Track Ball Bearing)	MI-40791
Headwheel Panel Assembly (Narrow Track Air Bearing)	MI-40799
Guide Position Adjuster for Headwheel Panel	MI-43351
Video Preamplifier Module (spare)	MI-40603-BS
Mechanical Tape Splicer (15 IPS)	MI-40772
Mechanical Tape Splicer (7.5 IPS)	MI-40748
Test Module Extender	MI-40649
Special Module Extender	#557301
Monochrome Video Alignment Tapes (525 line, 60 cps.)	MI-40793
Monochrome Video Alignment Tapes (625 line, 50 cps)	MI-40797
TM-27AC Color Monitor, Cabinet 17"	MI-40232-A
Tape Head Degausser	MI-11995

Specifications

General

Storage Medium ..... Magnetic tape 2" (5.08 cm) wide
Reel Size ..... Up to 14" (35.56 cm) reels

Tape Speed:	50 Cycle	60 Cycle
Normal Speed	15.6" (39.7 cm)	15" (38.2 cm)
Half Speed	7.8" (19.8 cm)	7.5" (19.1 cm)
Picture-Sound Separation:		
Normal Speed	14.8 frames sound leading	18.5 frames sound leading
Half Speed	29.6 frames sound leading	37 frames sound leading
Playback Time:		
Normal Speed	61 min. on a 12.5" (31.75 cm) reel	64 min. on a 12.5" (31.75 cm) reel
Half Speed	122 min. on a 12.5" (31.75 cm) reel	128 min. on a 12.5" (31.75 cm) reel
Rewind Time	Approx. 4 min. for 4800 ft. of tape	Approx. 3 min. for 4800 ft. of tape

Stopping Time ..... Less than 0.2 seconds from play

Playback Time Reference ..... To power line or local sync

Start Time for Stabilized Picture and Sound:
Tone Wheel Mode ..... Less than 5 seconds from Stop, Less than 3 seconds from Standby
Switchlock Mode ..... Less than 5 seconds from Stop

Tape Interchangeability ..... Tapes made on standard quadruplex machine may be played back on the TR-3 providing they are made in accordance with all applicable proposed SMPTE recommended practices and proposed ASA standards.

Tape Timer ..... Accumulated time measured in minutes and seconds at 15 in/sec. tape speed on a 60 cycle machine and 15.6 in/sec. (39.7 cm) on a 50 cycle machine. Accuracy—Repeatable within 3 seconds per hour.

Horizontal Displacement of Vertical Aligned Picture Elements ..... Not to exceed 20 nsec. at junction points

RF Limiting ..... Sufficient to allow RF signal level into the demodulator to be 55 db below nominal before video signal is affected by a 10% reduction in level

Signal Levels

Input Signal Requirements:
SYNC ..... Negative polarity 3 to 5 volts p/p loop through or terminate in 75 ohms

Output Signal Availability:
VIDEO-MONOCHROME or COLOR
(Processed) ..... Three line outputs—two composite—one composite or non-composite internally selected. Source impedance, 75 ohms. Load impedance, 75 ohms.

VIDEO-MONOCHROME or COLOR
(Demodulator Output) ..... One line composite, 1 volt p/p nominal into 75 ohms
Video Level ..... 0.5 to 1 volt p/p
Sync Level ..... 0.2 to 0.4 volt p/p
Pedestal Level ..... ±20% of video level

AUDIO:
One Line Output ..... +18 dbm max. into 150/600 ohms balanced or unbalanced line
One Phone Jack Output for High Impedance Phones

RF COPY ..... 1 volt p/p level, 75 ohms terminated

Electrical

Power Requirements:
60 cycles ±2 cycles ..... 115 volts a-c ±10% single phase 1.5 kw
50 cycles ±2 cycles ..... 230 volts a-c ±10% single phase 1.5 kw

Frequency Response:
Video Channel—Monochrome
405/525 Lines ..... ±1.5 db 25 cycles to 4 mc
625 Lines ..... ±1.5 db 25 cycles to 5 mc
Audio Channel:
Normal Speed ..... ±2 db 50 to 15,000 cycles
Half Speed ..... ±2 db 60 to 10,000 cycles

Signal-to-Noise Ratio:
Video on an interchangeable tape basis, 4 db pre-emphasis, 15 ips
405/525 Line Monochrome ..... Better than 40 db (37 db at 7½ ips)
625 Line Monochrome ..... Better than 37 db (34 db at 7½ ips)
Audio ..... Better than 50 db, measured overall between a recorded level corresponding to 3% total rms distortion at 1,000 cycles per second and noise present when playing back an erased unmodulated tape

Transient Response ..... Rise time less than 150 nsec. Overshoot less than 12% on 60 nsec. sine-squared window test pattern

Ambient Temperature and Humidity ..... Between 35° and 110°F (0° to 45°C) at 20 to 90% relative humidity

Wow and Flutter:
Total RMS Wow and Flutter—0.5 to 250 cps range:
Normal Speed ..... 0.2% rms
Half Speed ..... 0.25% rms

Mechanical

Dimensions:
Width ..... 22" (56 cm)
Height (with built-in casters) ..... 66" (168 cm)
Depth ..... 24" (61 cm)

Weight ..... Approx. 600 lbs. (273 kg)

Cooling ..... Filtered, forced air

Ordering Information

The Type TR-3 Television Tape Player is available for operation on 525, 625 and 405 line tv standards.

Two basic models are available:
(1) a 525 line machine
(2) a switchable machine for 525/625/405 line operation

They may be ordered as follows:
For 525 line operation, specify ES-43570

For 525/625/405 line operation, 50 cycles, specify ES-43572-405

All models include the following equipment complement:
1 TV Tape Player (cabinet mounted) complete
1 Headwheel Panel Assembly (Ball Bearing)
1 Kit of Maintenance Materials
1 Monochrome Video Alignment Tape
1 Mechanical Guide Adjustor

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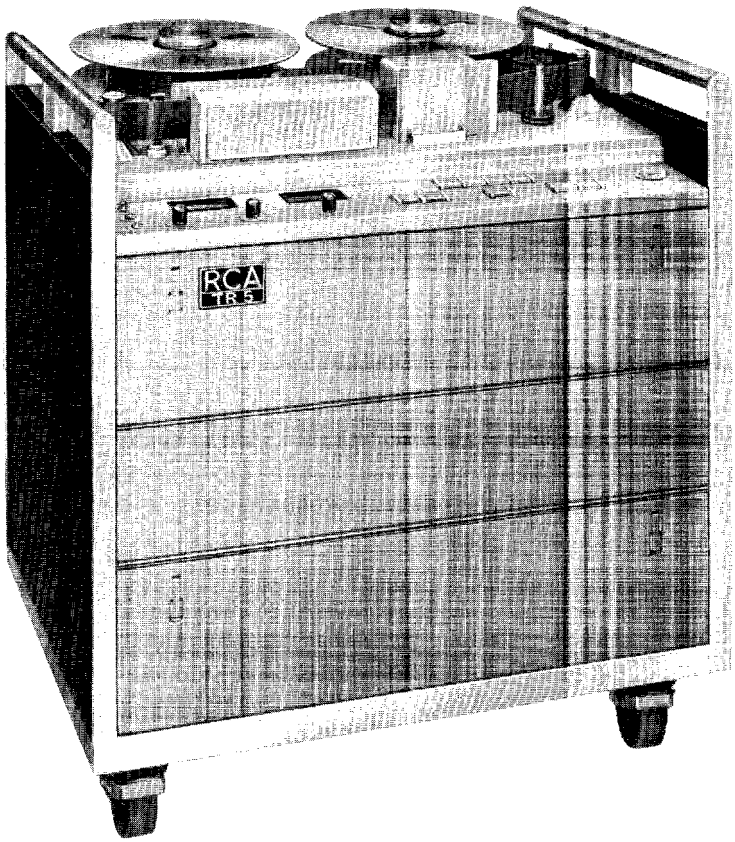
STAT

catalog B.7014

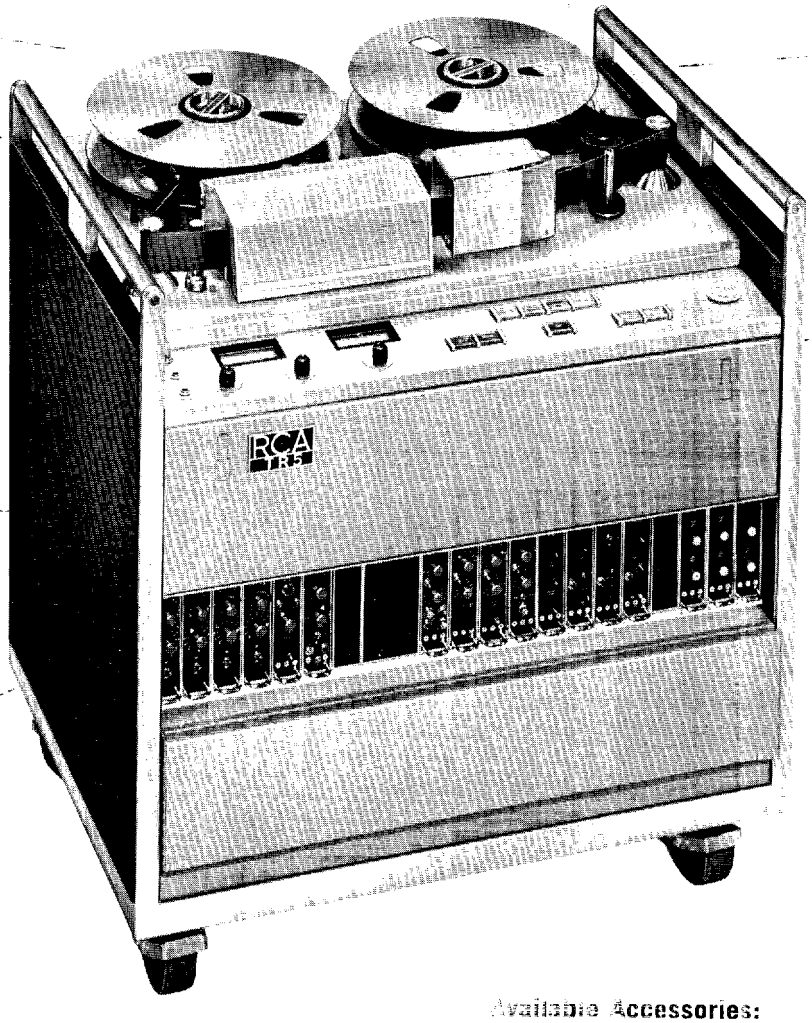
Mobile TV Tape Recorder,

- Compact, Transportable, Quadruplex Recorder
- Makes and Plays Tapes for Broadcast and Closed Circuit
- Records both Monochrome and Color Pictures



4P3

Mobile TV Tape Recorder
for quadruplex tapes in studio or field

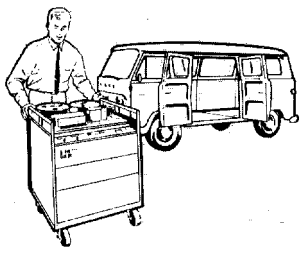


Available Accessories:

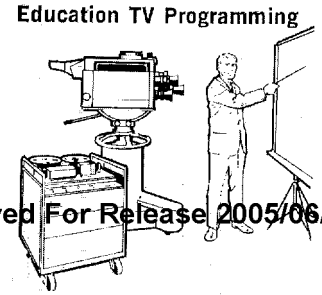
- **Electronic Splicer**
- **Audio Cue Record/Playback Channel**
- **Remote Control**

COMPACT QUADRUPLEX RECORDER FOR A VARIETY OF APPLICATIONS

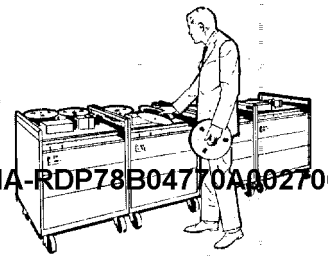
Mobile Recording



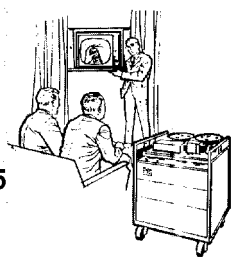
Education TV Programming



Tape Duplication



Client Presentations



Mobile Tape Recorder, TR-5

The TR-5 Mobile TV Tape Recorder is an RCA "New Look" equipment especially designed for recording of video tapes at various locations in the plant or in the field. It is small in size and mounted on casters for easy movement from one location to another. The recorder conforms to highest broadcast standards. Tapes recorded on it are fully compatible with all standard broadcast quadruplex recorders. For closed circuit applications it comprises a complete recording and playback facility. It may also be used for on-air playback by adding a signal processing amplifier.

Description

The RCA Type TR-5 TV Tape Recorder is engineered to produce TV Tapes that faithfully reproduce the high quality monochrome and color pictures now provided by new, improved TV Cameras. It employs standard RCA transistorized, interchangeable modules. It accommodates cue record/playback and electronic splicer accessories.

Switchable Standards

The TR-5 is equipped for operation on international (switchable) or domestic standards. To change from one standard to another, an operator merely moves the standards selector switch to the desired position. This master circuitry provides instantaneous switchover from 525 to 625 to 405 TV line standard.

Built-In Two Speed Operation

Circuits to permit choice of operating speeds, 15 or 7½ inches per second, are built into the TR-5. Recording time of up to 60 minutes at 15 IPS and 120 minutes at 7½ IPS is possible with the 12½-inch tape reels.

Interchangeable Sub-Assemblies

The modular construction of the TR-5 mobile recorder means that many of the sub-assemblies are interchangeable with the TR-3/4 and TR-22 recorders. All modules are completely accessible and by means of a module extender it is possible to service the machine while in operation.

Transistorized for Reliability

Advanced transistorized modular circuits are used through the TR-5. These solid state circuits operate on lower voltages and require much less power and generate less heat. As a result power supplies are small, efficient units, and air conditioning requirements are reduced. Transistors have proved extremely reliable and stable. All TR-5 circuits are conservatively rated, and permit semi-automatic "pre-set" type of operation. Warm-up time is greatly reduced, practically eliminated, since no warm-up cycle is required.

Record/Playback Circuitry

The record circuitry of the TR-5 includes a standard modulator and four standard record amplifiers. Each of the amplifiers provide quadrature delay as well as FM level control. Color or monochrome video signals are recorded with amazing realism.

The playback circuitry involved includes playback quadrature delay, four-channel equalization and head switching. Switchlock is also featured as part of the basic machine. For direct on-air broadcasts it is recommended that a signal processing amplifier be utilized. The equipment is designed with built-in audio playback for line drive as well as earphone level monitoring. Stable video playback of any properly recorded quadruplex tape is achieved.

Compact-Transportable

The Tape Recorder is contained in a small cabinet on casters measuring only 31 inches high (37 inches with casters), 33 inches wide and 24 inches deep. It weighs approximately 475 pounds. It may readily be moved from one studio to another or transported to remote locations.

Ease of Servicing

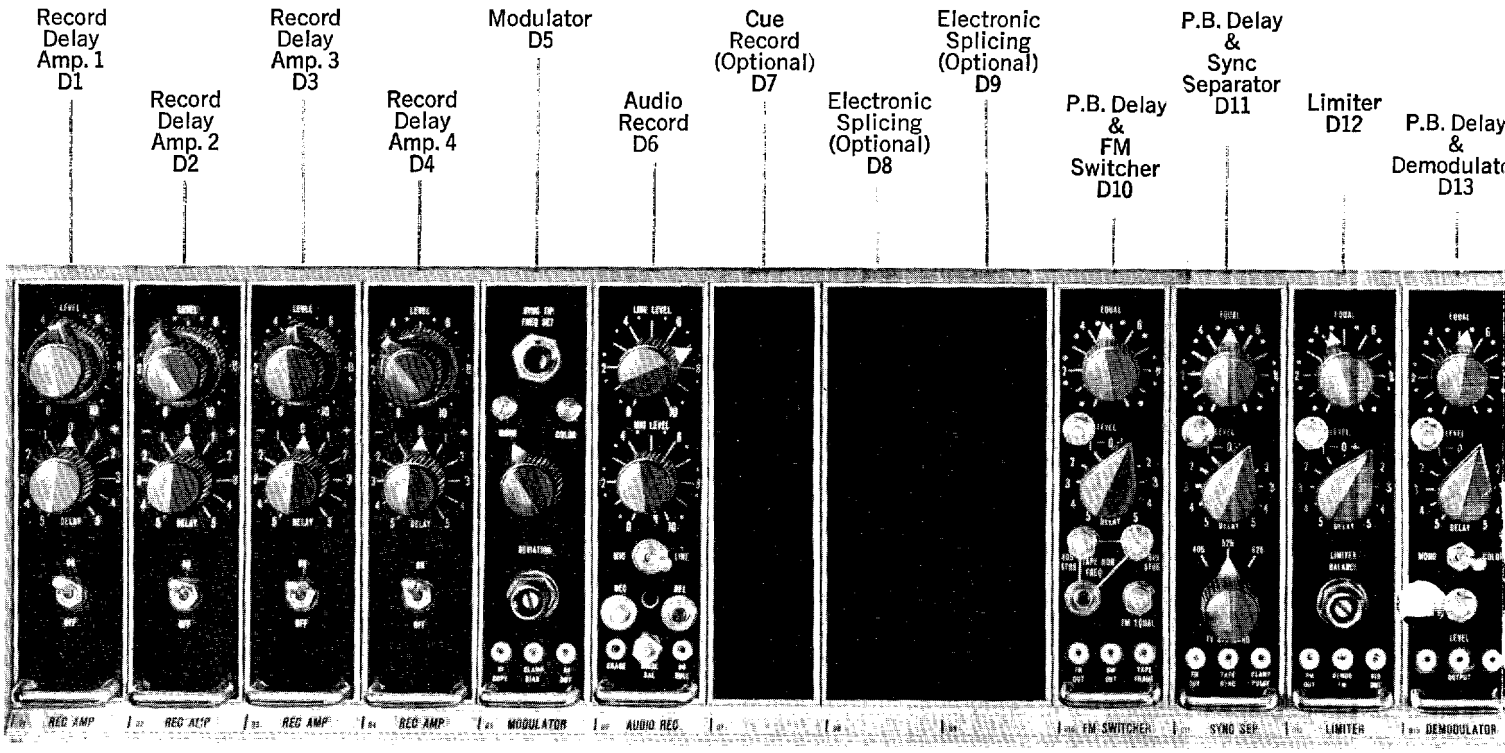
TR-5 modules can be easily removed for repair or replacement. They may also be checked without removing through use of module extenders supplied with the equipment. Spares can be inserted as fast as one can pull out the module and plug in another. This standardization of modular circuits permits interchange of many modules between various RCA models in multiple equipment installations. Furthermore, complete modular spares can be stocked for emergency use.

Horizontal Tape Transport

The low contour of the TR-5, so essential for ease of transportation to remote locations has been achieved not only by the compact transistorized circuitry, but also by a horizontally mounted tape transport. This transport has all the conveniences and fine performance qualities of the TR-3 and TR-4 Tape Recorders. Air lubricated guide posts provide long tape life, while tapered guide post flanges aid tape threading. The transport panel is hinged for complete access to components.

Finger Tip Controls

Push-button operating controls are conveniently located. They afford complete mode control of play, record, fast forward, fast reverse and stop. In addition there is a two-speed indicator, local and remote switch, audio/mike switch and (tone wheel/switchlock) indicator. A switchable audio-video VU meter and metering facilities for control track phasing can also be used for measuring sync tip frequency. Three front panels provide complete access to mode control modules, the module bank, and the base of the equipment where power supply and air system are located.



TR-5 Module Bank . . . Description of Functions

D1—Record Delay Amplifier #1
The Record FM signal is increased in level to a value sufficient for recording on tape and adjustable delays are introduced to compensate for head quadrature errors.

D2—Record Delay Amplifier #2
Same functions as D1.

D3—Record Delay Amplifier #3
Same functions as D1.

D4—Record Delay Amplifier #4
Same functions as D1.

D5—Modulator
Input video is pre-emphasized, clamped at the sync-tip level and used to modulate a capacity-diode-controlled heterodyne modulator. Circuitry is included for r-f copy facility.

D6—Audio Record
Provides audio record bias and erase currents. The microphone input control is included in the module.

D7—Cue Record (Optional)
Space is provided in the TR-5 for the accessory Cue Record Module.

D8—Electronic Splicing (Optional)
Space is provided for the accessory Splice Timing Module.

D9—Electronic Splicing (Optional)
Space is provided for the accessory Splice Logic Module.

D10—FM Switcher
This module includes a 2x1 switching circuit which alternately connects heads 1 and 3 and heads 2 and 4 to the output. Also included are tape sync processing circuits that produce horizontal-rate reference, field-rate reference and frame-rate reference. The playback delay amplifier, FM equalizer and FM level control for Head #1 are located in this module.

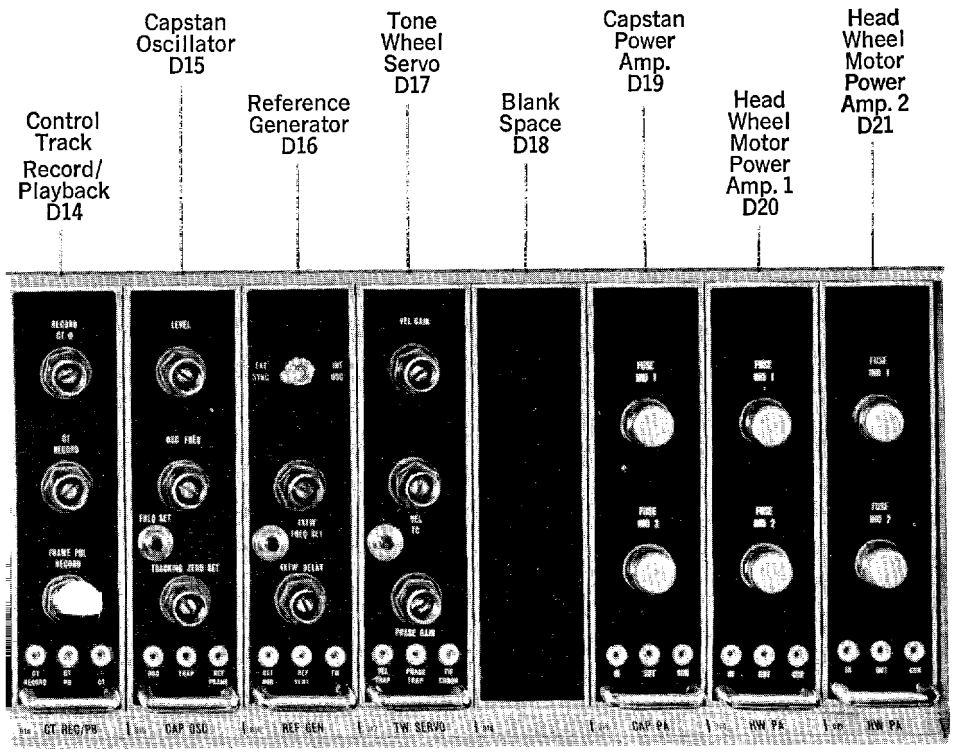
D11—Sync Separator
This module includes a sync separator and circuitry to provide the switching pushout pulse. The playback delay amplifier, FM equalizer and FM level control for Head #2 is included.

D12—Limiter
Module includes limiting circuits where the FM signal is converted to push-pull, passed through several stages until overall limiting characteristic of at least 55 db is achieved. The playback delay amplifier, FM equalizer and FM level control for Head #3 is included.

D13—Demodulator
The Playback delay amplifier, FM equalizer and FM level control for Head #4 is included in this module which accepts signal from limiter and contains demodulator and output filter circuits. Provides output line driver.

D14—Control Track & Record/Playback
The 240-cycle control track signal is amplified, filtered to produce a clean 240-cycle sine wave, clipped, and shaped into a pulse. The pulse is then fed to a chain of binary counters that divide the pulse frequency by eight to produce a 30-cycle output pulse. Switchlock circuitry is also provided in this module.

D15—Capstan Oscillator
Acts as a phase detector which compares incoming pulse to the local frame pulse and produces a d-c voltage proportional to the magnitude of the phase error. The d-c error voltage controls the frequency of the oscillator which supplies the drive frequency for the capstan motor. Tape speed is thereby synchronized to local reference.



D16—Reference Generator

Processes local sync to produce horizontal-rate reference and field-rate reference. Provides playback reference from internal oscillator when local sync is not available. Module also includes the tone wheel processor which shapes the tone-wheel pulse and provides 960-cycle switcher drive.

D17—Tone Wheel Servo

Derives error signal controlling the headwheel motor. Module includes circuits which amplitude-modulate the headwheel motor-drive sine waves. Gives wide band two-phase output.

D18—Blank Space

D19—Capstan Power Amplifier

Provides power amplification required by the capstan motor.

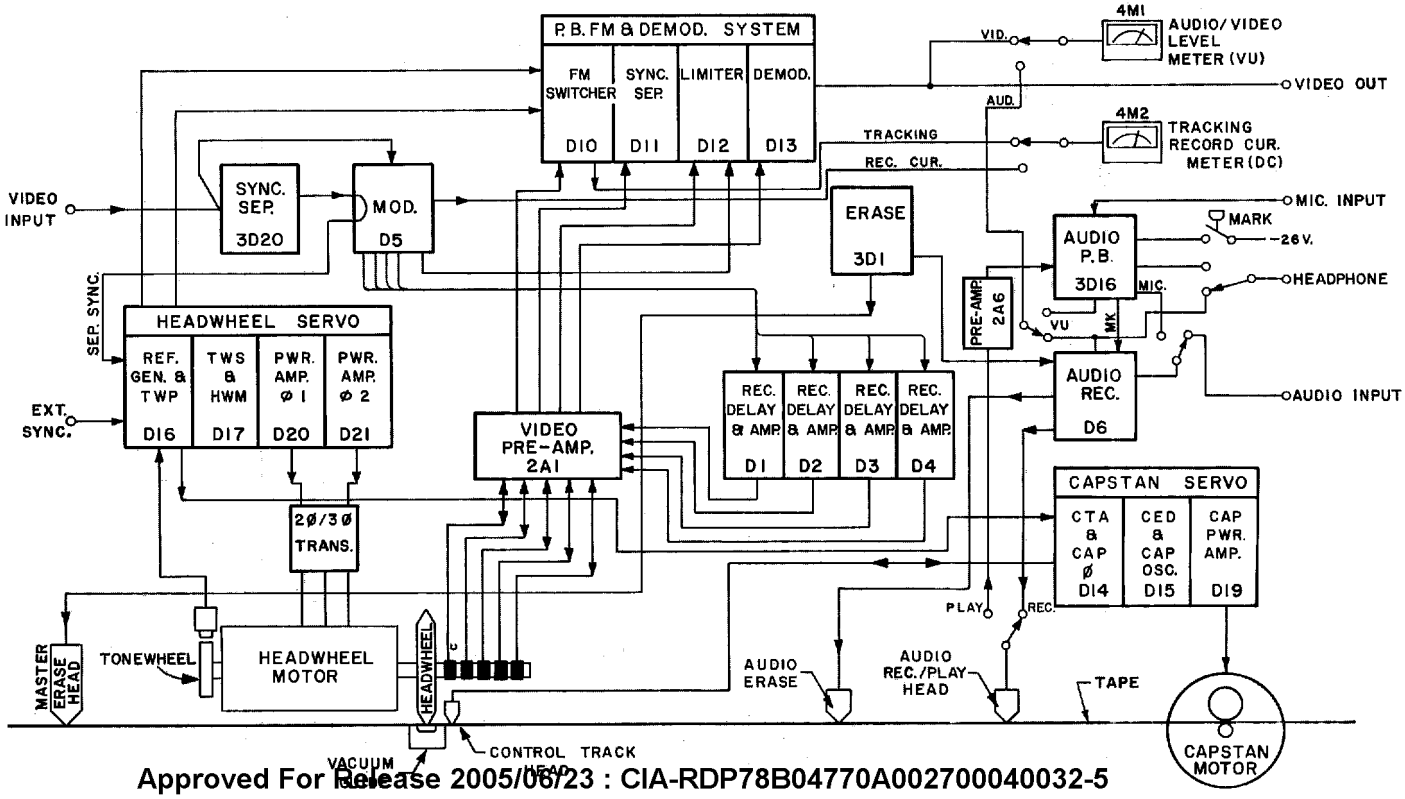
D20—Head Wheel Motor Power Amplifier #1

Power amplifier for one phase of the headwheel motor drive.

D21—Head Wheel Motor Power Amplifier #2

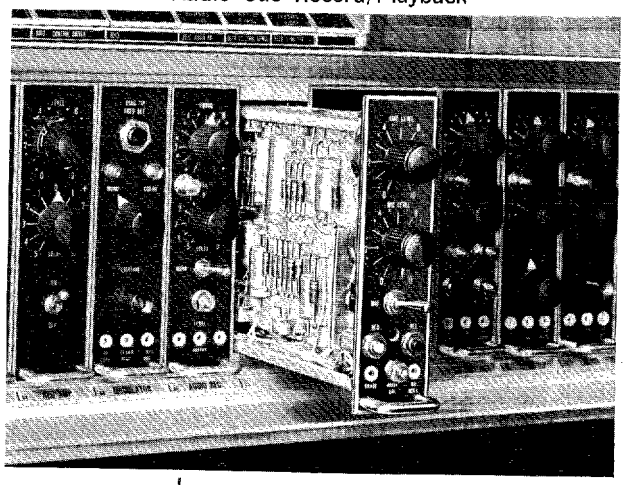
Power amplifier for one phase of the headwheel motor drive.

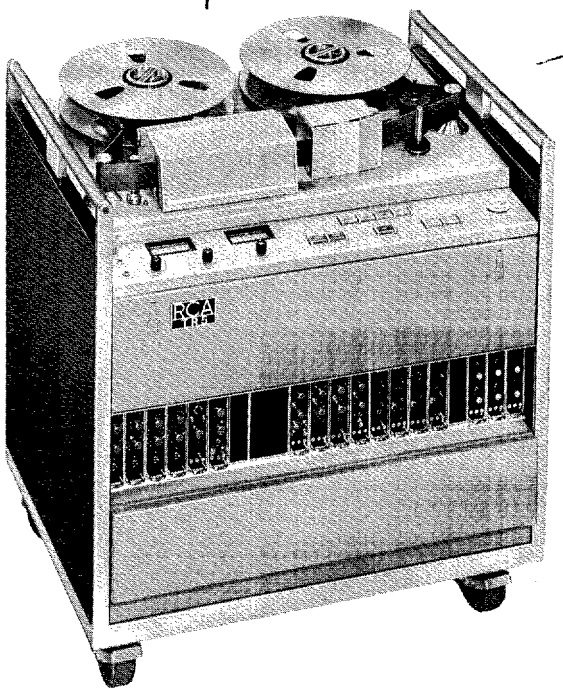
FUNCTIONAL DIAGRAM



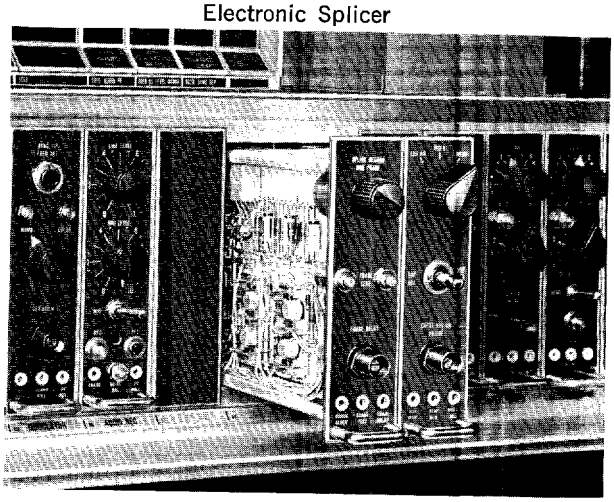
Modular Accessories
increase recording capability

Audio Cue Record/Playback

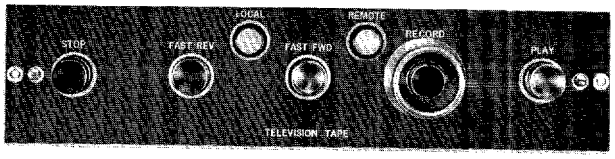




Electronic Splicer



Remote Mode Control



Approved For Release 2005/06/23 : CIA-RDP78B04770A002700040032-5

Major Accessories

Space is provided in the TR-5 for the addition of two convenient accessory equipments—an audio cue channel and the electronic splicer.

Cue Record/Playback

The cue record/playback accessory head provides a means for recording cue information along one edge of the video tape. This can be in the form of voice, tone or digital information. A special feature of the program and cue channel is that recording can be done independent of video recording; in other words, sound may be dubbed in while playing back or previewing the video signal.

Electronic Splicing

Splicing and editing of TV tape by electronic means can be accomplished with the TR-5 by addition of an electronic splicer. It will permit program segments to be added to a recorded segment or inserted within it. It operates at either 7½ or 15 IPS tape speeds.

The equipment comprises three transistorized modular units (splice timing, splice control and splice logic modules), selective erase head, wiring harness and auxiliary modification material.

The modular construction affords easy accessibility to all components. Furthermore, removal of any module automatically returns the tape recorder to normal operation. This by-pass feature is only one of several improvements in electronic splicing. Other features are two-speed operation, switchable standards, and push-button set-up procedure.

Remote Control

A Remote Mode Control Panel, MI-40691, enables the following functions to be performed: stop, fast forward wind, reverse wind, record and play. The control panel, can be operated from either an internal or external power source.

COMPLETE LIST OF ACCESSORIES

Electronic Splicing	ES-43566
Cue Record/Playback	MI-43348
Remote Control Panel (Mode)	MI-40691
Air Bearing Conversion (less Air Bearing Headwheel Panel; for external mounting—includes Air Compressor)	MI-43365
Air Bearing Conversion (less Air Bearing Headwheel Panel; for external air supply—does not include Compressor)	MI-43364
Headwheel Panel Assembly (Standard Track Air Bearing)	MI-40790-A
Headwheel Panel Assembly (Standard Track Ball Bearing)	MI-40760-B
Headwheel Panel Assembly (Narrow Track Air Bearing)	MI-40799
Headwheel Panel Assembly (Narrow Track Ball Bearing)	MI-40791
Guide Position Adjuster for Headwheel Panel	MI-43351
Video Preamplifier Module (spare)	MI-40603-BS
Mechanical Tape Splicer (15 IPS)	MI-40772
Mechanical Tape Splicer (7½ IPS)	MI-40748
Test Module Extender	MI-40649
Special Module Extender	#557301
Special Microphone	MI-11030-1
Crystal Headset	MI-38026-2
Monochrome Video Alignment Tapes (525 line, 60 cps)	MI-40793
Monochrome Video Alignment Tapes (625 line, 50 cps)	MI-40797
Automatic Magnetic Tape Eraser	MI-10880-TV
Tape Head Degausser	MI-11995

Specifications

Record

Recording Medium.....Magnetic tape 2″ wide

Tape Speed:	50 Cycle	60 Cycle
Normal Speed	15.6″ (39.7 cm)	15″ (38.2 cm)
Half Speed	7.8″ (19.8 cm)	7.5″ (19.1 cm)
Picture-Sound Separation:		
Normal Speed	14.8 frames sound leading	18.5 frames sound leading
Half Speed	29.6 frames sound leading	37 frames sound leading
Recording Time:		
Normal Speed	61 min. on 12½″ reel (4800 ft.)	64 min. on 12½″ reel (4800 ft.)
Half Speed	122 min. on 12½″ reel (4800 ft.)	128 min. on 12½″ reel (4800 ft.)
Rewind Time	Approx. 5 min. for 12½″ reel	Approx. 4 min. for 12½″ reel

Stopping Time.....Less than 0.2 sec. from record or play mode

Recording Time Reference.....Composite video signal

Starting Time for Stabilized Picture and Sound.....5 secs. from stop; 3 secs. from set-up

Tape Interchangeability:

Record.....Tapes recorded on the TR-5 are made in accordance with all applicable proposed SMPTE recommended practices and proposed ASA standards and may be played back on any quadruplex machine.

Horizontal Displacement of Vertical Aligned Picture Elements.....Not to exceed 0.02 microseconds when recordings from the TR-5 are played back on machines adjusted for correct playback of MI-40793 or 40797 alignment tape.

Input Signal Requirements:

VIDEO.....Input signal level may be between 0.8 and 1.2 volts p/p composite signal; signal may be looped through or terminated in 75 ohms.

AUDIO.....Line input level between −20 dbm and +18 dbm into a 10,000 ohms balanced bridging impedance

SYNC.....Negative polarity 3 to 5 volts p/p loop through or terminated in 75 ohms

Playback

Playback Time Reference.....To external sync or internal reference

Output Signal Availability:

Video (Unprocessed).....One composite line; video level 1.0 volt p/p into 75 ohms

Audio.....(1) One line output +18 dbm max. into 150/600 ohms balanced or unbalanced line. (2) One monitoring output for high impedance phones

Audio Mark.....A built-in audio mark oscillator is provided for insertion of a 400 cycle tone on the Audio Talk

Power Requirements.....115/230 volts a-c, ±10%, 48-62 cycles, single phase, 1.2 kw

Frequency Response:

Video Channel Monochrome.....405/525 ±1.5 db 25 cycles to 4 mc; 625/819 ±1.5 db 25 cycles to 5 mc

Audio Channel:

Normal Speed.....±2 db 50 to 15,000 cycles

Half Speed.....±2 db 60 to 10,000 cycles

Signal-to-Noise Ratio:

Video at 15 ips

405/525 Line Monochrome.....Better than 40 db (37 db at 7½ ips)

625 Line Monochrome.....Better than 37 db (34 db at 7½ ips)

Audio.....Better than 50 db measured overall between a recorded level corresponding to 3% total rms distortion at 1000 cycles per second and noise present when playing back an erased unmodulated tape

Wow and Flutter:

Total RMS Wow and Flutter 0.5 to 250 cps range:

Normal Speed.....0.2% rms

Half Speed.....0.25% rms

Picture Jitter.....Recordings from the TR-5 may be played back on a TR-22 or equivalent machine in Pixlock mode with picture jitter less than ±0.1 microsecond

Ambient Temperature and Humidity.....Between 35° and 110°F (0° and 45°C) at 20 to 90% relative humidity

Mechanical

Dimensions:

Width.....32¾″ (83 cm)

Height:

Overall with casters.....37″ (94 cm)

Overall less casters.....31″ (79 cm)

Depth.....24″ (61 cm)

Weight.....Approx. 475 lbs. (215.5 kg)

Cooling.....Filtered, forced air

Ordering Information

The Type TR-5 Mobile TV Tape Recorder operates on 525, 625, and 405 line tv standards.

Type TR-5 TV Tape Recorder complete ES-43565

Including the following:

1 TV Tape Recorder (Transportable Cabinet) complete

1 Headwheel Panel Assembly (Ball Bearing)

1 Kit of Maintenance Materials MI-43350

1 Monochrome Video Alignment Tape:
525 Line MI-40793
625 Line MI-40797

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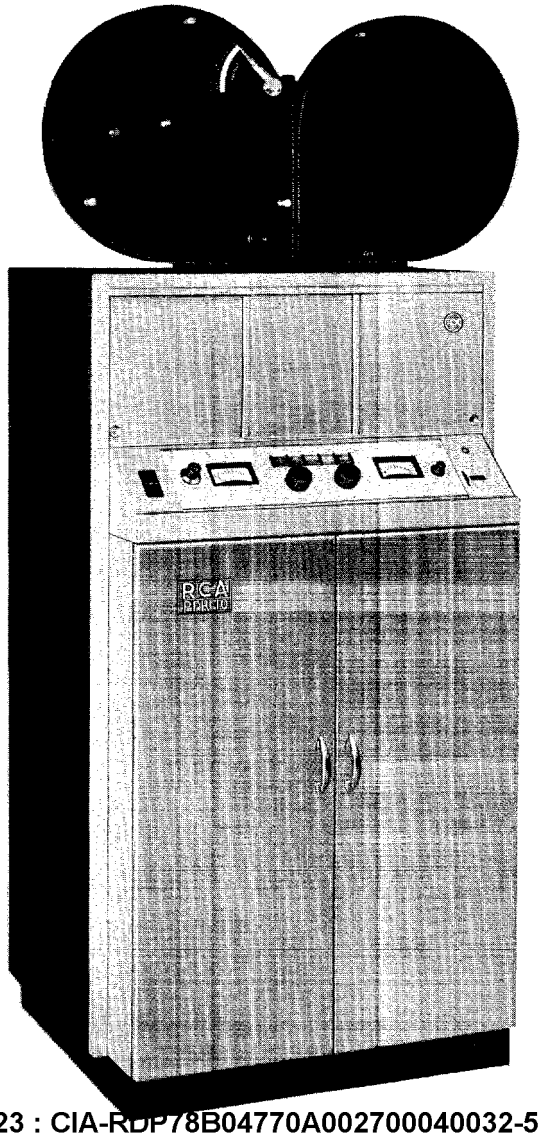
BROADCAST AND COMMUNICATIONS PRODUCTS DIVISION, CAMDEN 2, N.J. • RCA INTERNATIONAL DIVISION, 30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y., U.S.A.

Processing
catalog PTV.1600
Viscomat

Television Film Recorder, Type TFR-16

- Produces high quality 16mm films, without "Shutter bar"
- Uses readily available panchromatic film
- Exclusive "Line Erase" provides sharp photographic picture quality results
- Simple, reliable operation--- no need for specialized skills to manipulate controls
- 2400-foot cassettes (1 hour recording time)



Description

The Professional Television Film Recorder, Type PFR-10, is a compact self-contained unit for recording a standard television picture display on 16mm film. The image display tube in the PFR-10 is normally supplied with a P4 phosphor which permits a variety of panchromatic film types to be used with this recorder. For the semi-skilled operator, the adaptability and exposure latitude which are characteristic of panchromatic film virtually guarantee a good "take" from start to finish. Other stock, such as type 7374 television recording film, may also be used with the PFR-10 recorder.

Wide Range of Applications

The PFR-10 film recorder lends itself to many television recording applications. The modest cost, compact size and simplicity of operation of this unit make it particularly desirable for use in educational institutions, advertising agencies, military training installations and government agencies. The universal availability of 16mm film projectors make this equipment a logical choice where multiple copies or repeated playbacks of a single copy of a television recording are required. Where the accumulation of a "library" of film is being considered, the low cost of 16mm film is also an important factor.

Simple, Reliable Operation

A minimum of operator skill or training is required to set up and operate the PFR-10 with professional results. The proven design of the 16mm recording camera frees the operator from "shutter bar" worries, and the operating parameters of the video display monitor are easily and accurately set by means of the built-in "calibrate" circuit. No external test equipment or waveform monitor is required to calibrate or operate the PFR-10.

The PFR-10 system includes an easy to operate 16mm recording camera specifically designed for film recording. This camera has a virtually vibrationless mechanism, and a fixed registration pin for precise frame registration. The pulldown principle employed uses only one reciprocating component. Pull-down is accomplished without the use of claws. The principles employed are of proven design with several years of actual field operation. The optical shutter is based upon a "lap dissolve" action which effectively eliminates shutter bar effects.

The PFR-10 camera, combined with the image display tube featuring P4 phosphor, produces film transfers of consistent quality.

A mechanical film footage counter with front panel readout is provided.

Built-in Calibrate Circuit

An important element of the PFR-10 system is the calibration circuit and meter which provides repetitive accurate setup of the recording channel. By means of this facility the operator is able to adjust pedestal or black level (bias) to provide a predetermined brightness level and to adjust video level (gain) to provide a predetermined contrast range. Both adjustments are quickly and easily made by "zeroing in" a front panel meter. There is continuous monitoring by meter of the video level so that the operator can achieve a standard operating condition.

The display monitor, recording camera and all associated circuitry for the PFR-10 recorder are housed in one compact cabinet which requires less than 6 square feet of floor space. The unit is supplied complete with 2400 foot film cassettes for a full hour of recording time, and includes provision for audio signal input to an optional optical or magnetic sound recording channel.

The display monitor utilizes a 10-inch tube. It has fully regulated B+ and anode power supplies. Aperture compensation is variable in amplitude from 0-10 db at a peak frequency of 7 mc.

"Line Erase" Provides Superior Picture Quality

A switch on the control panel of the PFR-10 provides the option of "line erase" which effectively eliminates the pattern of scan lines which is normally seen on television film recordings. The enhancement of picture quality due to "line erase" results in a recording quality comparable to still photographs.

The PFR-10 recorder is housed in a rugged welded steel cabinet mounted on casters. Ample space (standard 19-inch rack width) is provided inside the cabinet for the optional sound recording amplifiers and power supplies. Complete accessibility to the recording camera and video chassis is provided by sliding access doors and removable side covers.

ACCESSORIES

1200-ft. Film Magazine MI-10770-E

2400-ft. Film Cassette (two required for complete magazine) MI-29734

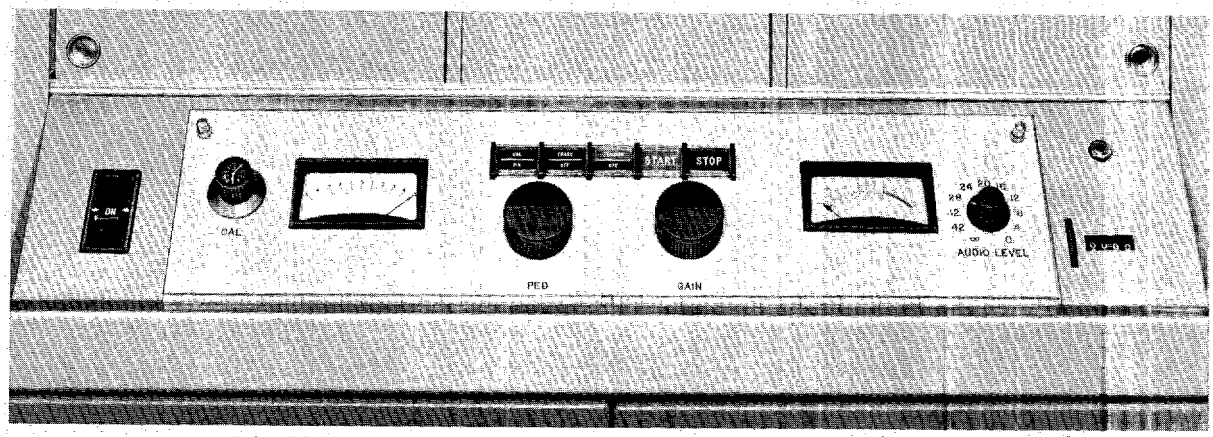
Single System Variable Area Optical Sound Recording Channel (Bach-Auricon) MI-29736-VA

Single System Variable Area Optical Sound Recording Channel (Maurer) MI-29744

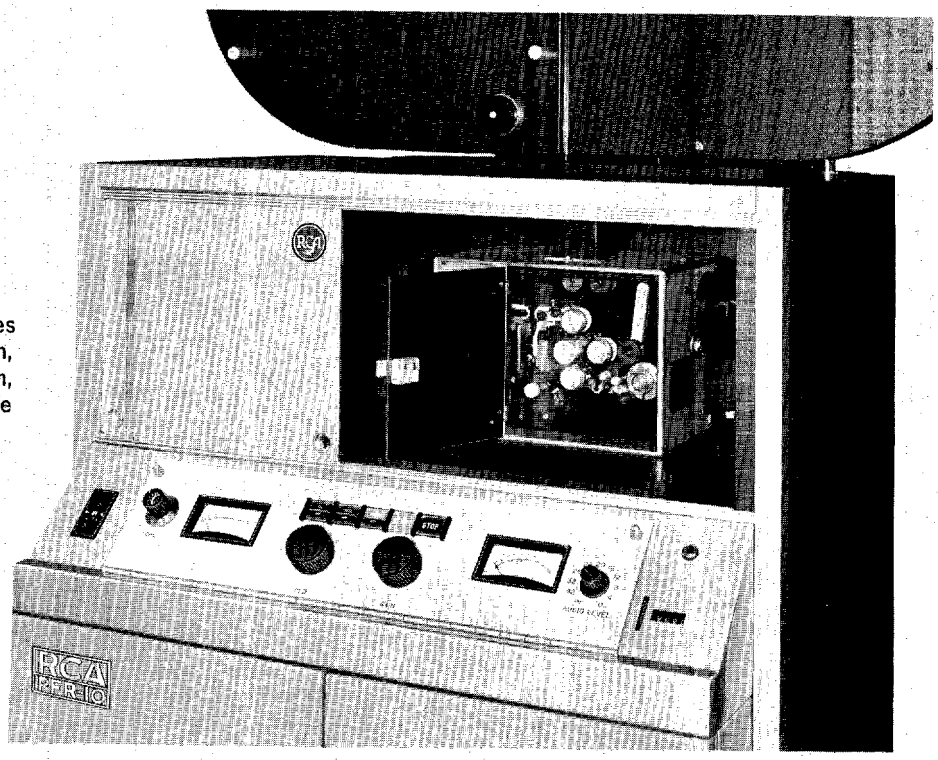
Single System Magnetic Sound Recording Channel MI-29738

MacBeth Model TD-100 Densitometer (Requires Model 20-13-060 Voltage Regulator)

Eastman Model 30 Viscomat Processor (Requires Model 1M Water Temperature Control Unit)



Close-up of control panel of PFR-10 illustrates ease of operation inherent in the system. Minimum controls and automatic functions permit unskilled personnel to produce excellent results.



PFR-10 camera features simplicity of operation, vibrationless mechanism, and fixed pin for precise frame registration.

Specifications

Electrical

Input Signals:
- Video
  - Composite Video Signal....In accordance with EIA and FCC specified color/monochrome signal standards
  - Composite Video Signal Level.....0.5 to 1.4 volts peak-to-peak
- Audio (optional).....–10 to +8 VU into 600 ohm balanced line matching input
- Power.....117 volts ±10%, 60 cycles a-c single phase, 300 watts

Performance

General:
- Recording Medium.....16mm double or single perforated film
- Film Speed.....24 frames per second
- Picture-Sound Separation.....26 frames, sound leading
- Recording Time, 2400 ft. cassettes.....66 minutes
- Starting Time.....3 seconds maximum

Camera

Fast-film pull-down mechanism
Buckle trip interlock
Film Capacity: 2400 ft.
Fixed registration pin
Separate torque motor for magazine drive

Image Display Tube

- Diameter .....10″
- Raster Size.....5⅛″ by 6⅝″
- Deflection .....Electro-magnetic
- Focus .....Electro-static
- Phosphor P4
- Resolution.....700 lines minimum

General Specifications

- Deflection System.....Linearity deviation 2% max.
- Control System:
  - Brightness Reference .....Meter
  - Contrast Reference .....Meter
- Video Amplifier Bandwidth..... ±1 db to 10 mc
- Aperture Correction.....Maximum boost at 7 mc
- Boost.....Adjustable to 10 db

Mechanical Specifications

- Height.....60″ (76″ with film cassettes)
- Width .....32″
- Depth .....24″
- Finish.....Two tone blue textured vinyl
- Weight .....325 lbs.

Ordering Information

Type PFR-10 16mm Television Film Recorder.....ES-40970
525 lines, 60 fields, including:

1	MI-47850	Console Assembly
1	MI-29731-B	Recording Camera
2	MI-29734	2400-ft. Film Cassettes

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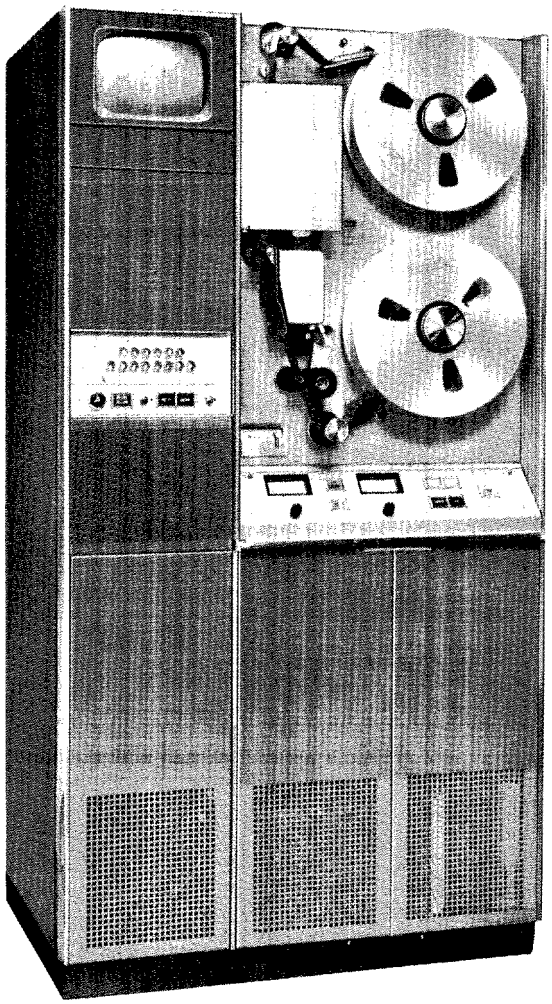
catalog B.3960

PRELIMINARY

Continuous Wideband Recorder, Type TR-4-CVR

The TR-4-CVR solid-state recorder/reproducer represents the latest in design techniques, assuring maximum reliability for practically all types of wideband recording requirements.



TR-4-CVR — Continuous Wideband Recorder

Excellent Time Base Stability

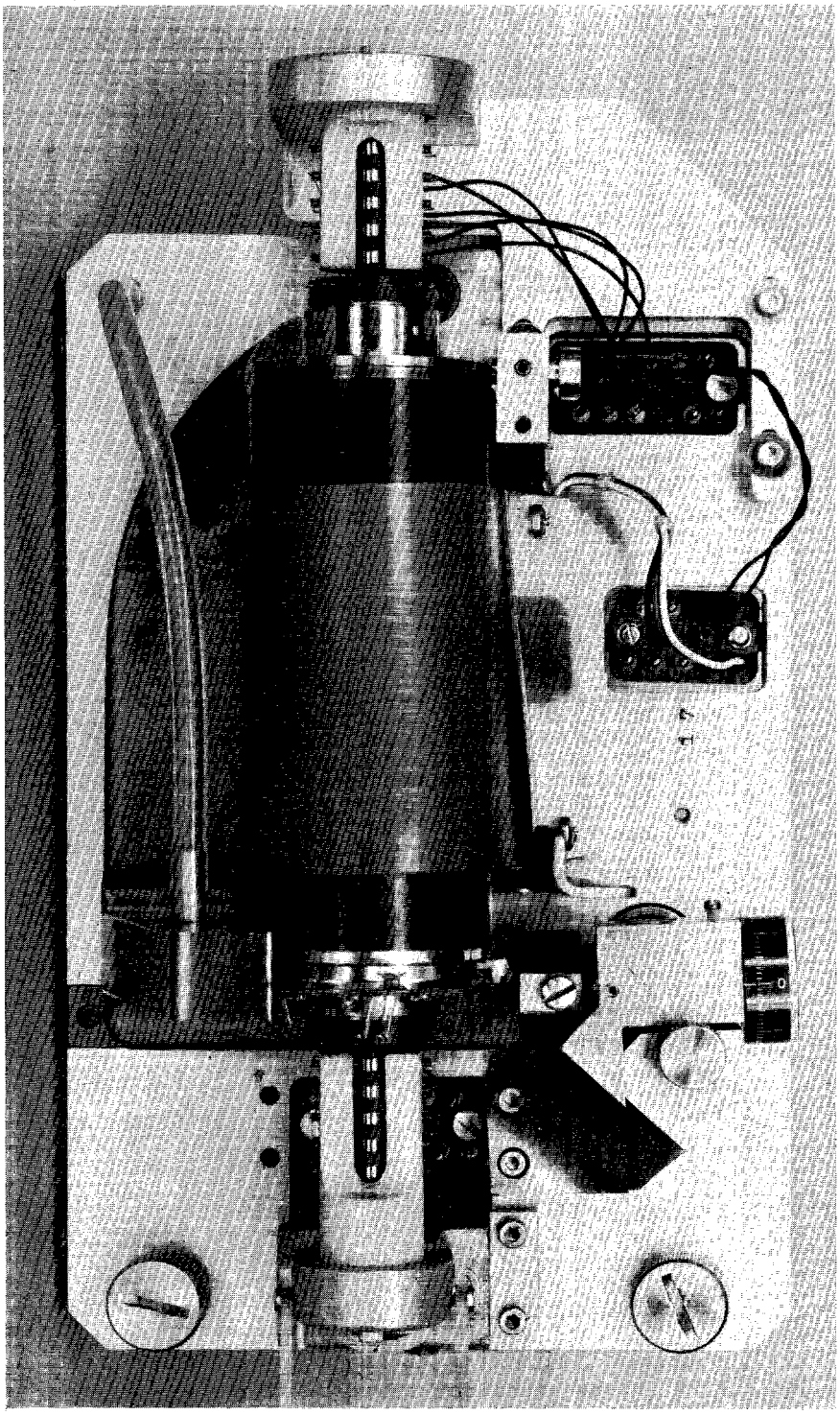
Continuous transient-free operation

Supplied with either one or two wideband channels

Airbearing Headwheel for maximum stability and long life

Approved For Release 2005/06/23 : CIA-RDP78B04770A002700040032-5

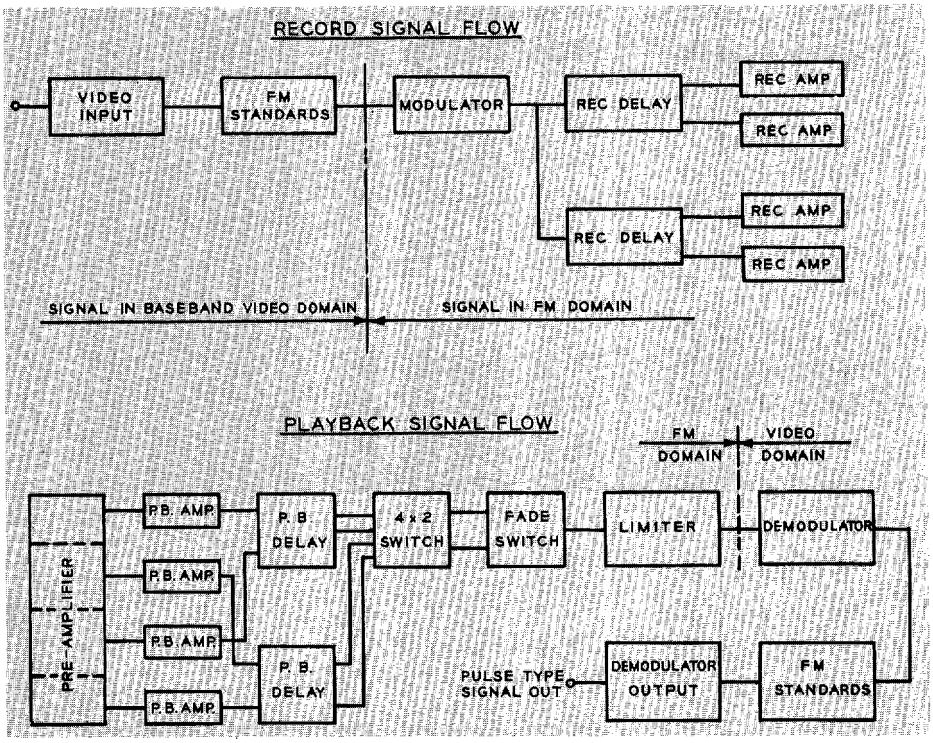
SELECTED FEATURES



- Outstanding dual channel performance due to superior Octaplex Headwheel Design
- Built-in precise crystal timing reference
- Switchable Frequency Response (4 mc/5 mc/6 mc)
- Full line of accessories for ultra-precise time-base stability
- Provision for range marker insertion
- Permits N time around range tracking
- Pulse amplitude linearity better than 5%
- Auxiliary Channel Standard Five Kilobit Data Rate
- Can be used to playback standard television informati

Dual Channel Octaplex Airbearing Headwheel Panel Assembly

Approved For Release 2005/06/23 : CIA-RDP78B04770A002700040032-5



FM & Video Block Diagram, TR-4-CVR

Applications

The TR-4-CVR is a low cost and extremely flexible wideband recorder.

The TR-4-CVR is an ideal instrument for use in recording radar, sine wave, predetection IF and PPI display information. It is suitable for applications requiring continuous pulse recording, bandwidths up to 6 megacycles, and excellent time-base stability. It can be used on board ship, for remote field installation, or in research laboratories.

The TR-4-CVR is completely modularized. It is designed to accept accessories that will provide varying degrees of time-base stability, data channel bandwidth, and remote control operation. It may be operated at either 7½ or 15 IPS recording speeds, providing continuous recording time to three hours maximum.

Description

The basic machine can be supplied in either of two versions, a single-channel continuous wideband recorder, Type TR-4-CVR; or a dual-channel continuous wideband recorder, Type TR-4-2-CVR. This dual channel recorder offers two 6-megacycle recording channels with crosstalk between the two channels held within 6 db below rms noise level. Inter-channel time-base stability of the basic TR-4-2-CVR is 100 nanoseconds peak. This can be further improved to 5 nanoseconds RMS by the addition of an electronic variable delay line accessory. (This is also available for the single channel recorder.) It provides time-base stability within each channel of 5 nanoseconds RMS.

The TR-4 series of recorders makes use of a new technique known as fade switching to provide continuous transient-free playback of pulse and analog information. Both the quadraplex and octaplex record/playback headwheel assemblies utilize air bearings and ultra-precise vacuum guide positioning. Both these factors play an important part in achieving the excellent time-base stability of which the TR-4-CVR is capable.

The TR-4-CVR will record one channel of video information of selectable bandwidth, either 4, 5 or 6 megacycles. In addition to this main channel, one 12½ kc audio channel and one auxiliary 5 kilobit data channel are also offered as standard. Additional options are available to further increase the kilobit rate of the data channel if required.

The all solid-state construction of the TR-4-CVR assures maximum dependability, reliability, and a minimum of maintenance. The equipment utilizes modular construction throughout. Controls are kept to a minimum to reduce operator error. Built-in features, such as a video monitor, enable the operator to readily set up the recorder, utilizing the standard SMPTE video alignment tape. A built-in microphone permits convenient optimization and alignment of the recording head assemblies. The TR-4-CVR is completely self-contained in a compact cabinet, measuring 33 inches wide, 66 inches high, and 22 inches deep, weighing approximately 800 lbs. The unit may be accommodated in standard rack dimensions.

LIST OF ACCESSORIES

30 Kilobit Data Channel

EVDL (Electronic Video Delay Line)

Spare Airbearing Headwheel Panel Assembly (Quadruplex)..... MI-40799

Spare Airbearing Headwheel Panel Assembly (Octaplex)..... MI-40896

Specifications

General

Recording Medium ..... Magnetic Tape 2" wide

Tape Speed:

	50 Cycle	60 Cycle
Normal Speed, (per sec.)	15.6" (39.7 cm)	15" (38.2 cm)
Half Speed (per sec.)	7.8" (19.88 cm)	7.5" (19.1 cm)
Dual Channel (per sec.)	31.2" (79.4 cm)	30" (76.4 cm)

Record/Playback Time:

Single Channel		
Normal Speed	61 min. on a 12.5" reel (4800 ft.)	64 min. on a 12.5" reel (4800 ft.)
Half Speed	122 min. on a 12.5" reel (4800 ft.)	128 min. on a 12.5" reel (4800 ft.)
Dual Channel		
Normal Speed	30 minutes	32 minutes
Half Speed	60 minutes	64 minutes
Rewind Time	Approx. 4 min. for 4800 ft.	Approx. 3 min. for 4800 ft.

Remote Control Option ..... Record, Play, Rewind, Stop

Recording Time Reference ..... Internal Crystal

Playback Time Reference ..... Internal Crystal

Tape Interchangeability ..... Tapes made on any machine may be played back on any other machine providing they are made in accordance with all applicable recommended practices and standards

Tape Timer ..... Accumulated time measured in minutes and seconds as 15 in/sec tape speed on a 60 cycle machine and 15.6 in/sec (39.7 cm) on a 50 cycle machine. Repeatable within 3 seconds per hour

Headwheel Warranty ..... 100 hours prorated
Average life 300 hours

Signal Levels

Input Signal Requirements:

Video ..... Input signal level may be between 0.5 volt p/p and 1.4 volts p/p composite signal. Signal may be looped through or terminated in 75 ohms

Audio ..... Line input level between —20 dbm and +18 dbm into a 10,000 ohms balanced bridging impedance

Digital ..... 5 Kilobit RZ Unipolar Format
Input Impedance = 100 ohms 1 = 2V ±0.25V
0 = 0V ±0.25V

Output Signal Availability:

Video

Three Line Outputs ..... Source impedance 75 ohms, load 75 ohms

Video Level ..... 0.5 to 1 volt p/p

Audio

One line output: +18 dbm max. into 150/600 ohms balanced or unbalanced line

One phone jack output for high impedance phones

One monitor output: For internal use, +37 dbm max. level into 8 ohms load (5 watts)

Digital ..... 5 Kilobit RZ Unipolar Format
Input Impedance = 100 ohms 1 = 2V ±0.25V
0 = 0V ±0.25V

Electrical

Power Requirements:

60 cycle ±2 cycles ..... 115 volts a-c ±10% single phase, 1.5 kw

50 cycle ±2 cycles ..... 230 volts a-c ±10% single phase, 1.5 kw

Frequency Response: (Full Track on Inetrchangeable Basis)

Video Channel

(Switchable) ..... ±3 db 30 cycles to 4 mc (40 db)
±3 db 30 cycles to 5 mc (36 db)
±3 db 30 cycles to 6 mc (32 db)

(NOTE: Custom low end response on special order).

Digital Channel ..... 5 Kilobits

Audio Channel:

Normal Speed ..... ±2 db 300 to 6 kc

Half Speed ..... ±2 db 300 to 5 kc

Transient Response:

Freq. Response Position	Rise Time Nanoseconds	Overshoot
4 mc	130	10%
5 mc	110	10%
6 mc	85	10%

Ambient Temperature and Humidity ..... Between 35° and 110°F (0° and 45°C) at 20% to 90% relative humidity

Pulse Amplitude Linearity 5%

Time Base Stability ..... ±300 nanoseconds absolute or 75 nanoseconds per millisecond

Optional Time Base Stability with EVDL ..... ±5.0 nanoseconds RMS absolute value

Mechanical

Dimensions:

Width ..... 33" (84 cm)

Height (with built-in casters) ..... 66" (168 cm)

Depth ..... 24" (61 cm)

Weight ..... Approx. 800 lbs. (366 kg)

Cooling ..... Filtered, forced air

Ordering Information

Two basic models are available:

TR-4-CVR Single Channel Continuous Wideband Recorder

TR-4-2-CVR Dual Channel Continuous Wideband Recorder

They may be ordered as follows:

TR-4-CVR (50 cycle), ES-43573-CVR
TR-4-CVR (60 cycle), ES-43751-CVR
TR-4-2-CVR (50 cycle), ES-43573-2-CVR
TR-4-2-CVR (60 cycle), ES-43571-2-CVR

All models include the following equipment complement:

1 TV Tape Recorder (Cabinet Mounted) complete
1 Headwheel Panel Assembly
1 Video Alignment Tape
1 Kit of Maintenance Materials

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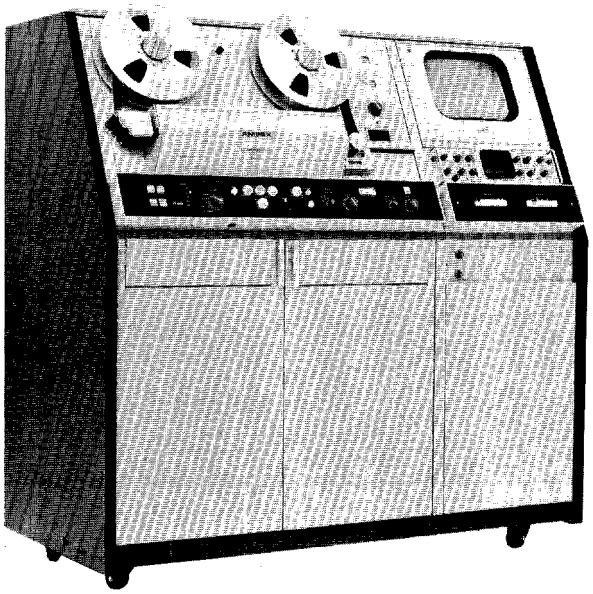
AMPEX

VR-2000 Teleproduction Videotape Recorder

The only major advancement in television recording since the introduction of the original Ampex Videotape Recorder in 1956.

The VR-2000 produces multi-generation color and monochrome dupes, production flexibility so superior that it has been called "the turning point in television tape production"!



The Ampex VR-2000 Videotape Recorder is more than an "improvement" over earlier designs; it is a totally new recorder, the result of a total evaluation of all available components, every technology involved, an evaluation of even the recording method and bandwidth. The result is a new standard of picture quality unmatched by any other television recorder in the world. The VR-2000 is being used by major networks in the U.S. for color recording and mastering . . . and by other networks throughout the world. With totally new electronic circuitry the K-Factor rating of the VR-2000 has been reduced to 1%. With the new high-band signal system, you can obtain color copies that compare with the original, monochrome dupes to the third generation . . . all with the quality of the master.

A New Standard

The traditional standards of bandwidth, signal-to-noise, and time base stability are inadequate for advanced teleproduction work or extensive duplication. Slight "improvements" have been suggested, but they are only half measures. The VR-2000 represents a totally *new* standard of performance. Extended bandwidth providing more room for color and an adequate guard band, dramatically increased signal-to-noise ratio, greatly improved time base stability.

The K-Factor Performance

The K-Factor measurement technique has been widely used in Europe and Australia for a number of years. Briefly, it is a measurement of a recorder's over-all performance in terms of transient response, and is expressed as a percentage. A theoretically perfect system would have a K-Factor of zero percent. Prior to the VR-2000, the best recorders could manage a K-Factor rating of about 5%. The VR-2000 has a K-Factor rating of 1%!

Total Teleproduction Capability

The picture quality put on tape by the VR-2000 is so high that color copies and monochrome copies to several generations can be made, all with master-like quality. To this add the entire range of Ampex editing equipment and accessories, the time-saving, built-in test instrumentation, the 99% transistorization, and you have a recorder that's unmatched by anything else, anywhere. This is your big competitive edge . . . it's the final step toward the full realization of tape as a total teleproduction medium!

Compatability With Other Recorders

Though the VR-2000 is a high-band recorder, it is fully compatible with all existing low-band machines using the transverse-scan, four-head technique. Further, the VR-2000 operates on all of the world's popular line and bandwidth standards, in color and monochrome. One of two preselected standards may be selected by a pushbutton on the control panel.

Features

Totally new, in concept and production · K-Factor of 1% · Improved signal-to-noise ratio of 46 db or better · New high-band signal system · Retractable erase head reduces tape-wear · Intersync* for synchronous operation · Built-in test instrumentation · 99% solid state (nuvistors or tubes are used where such use contributes to the high performance delivered by the VR-2000) · Fully compatible with other transverse-scan, four-headed recorders · Operates on 405, 525 and 625 line standards · Simple to operate, yet an "engineer's recorder" · Utilizes the full range of Ampex accessories for total teleproduction capability · Prestige and profit building potential through superior quality, reliability and flexibility.

Accessories

AMTEC* System: Time Element Compensator for perfect picture geometry.

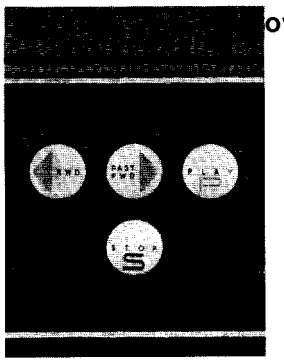
COLORTEC* System: For faithful color recovery of both masters and dubs.

ELECTRONIC EDITOR: For fast, accurate electronic splicing. Insert substitute scenes at will, or assemble programs scene-by-scene.

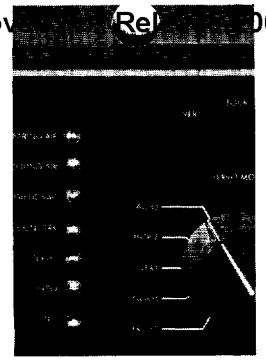
EDITEC* System: The final step in electronic editing, a programmer for the electronic editor. Accurate to the single frame, provides even for animation directly on tape.

Complete systems for closed circuit and broadcast television

Video File



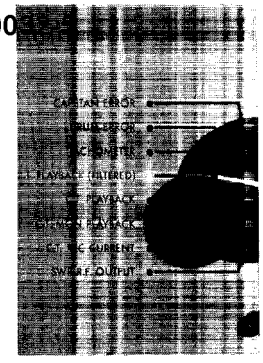
Operating convenience . . . assured by the functional grouping of all operating controls.



Full protection . . . afforded by tally lights and a host of protection features.

Accidental erasure prevented . . . a Teflon ring may be placed under the program reel, activating a microswitch and locking out all erase and record functions.

All new Mk IV video head . . . designed from the ground up, with integral video preamps, noise-free rotary transformers, air-bearing heads.



Full monitoring . . . switchable A-scope checks all important circuits; laboratory scope can be connected to the same circuits

Specifications

Physical Characteristics

Dimensions

Height, 63" (160 cm); width, 65" (165 cm); depth, 31" (78.7 cm).
Weight, 1300 lbs. maximum.

Temperature and Humidity

Temperature: 0°C to 55°C (tape limited).
Relative Humidity: 10% to 90%.

Power Requirements

Input Power: 117 volts ±10%, tapped for 105-115-125 volts, 60 cycle, 30 amps. (Will regulate and operate without changing taps from 105-125 volts.)
OR—
230 volts ±5%, tapped for 210-220-230-240-250 volts, 50 cycle, 15 amps.
Convenience Outlet: 4 outlets fused for 16A total.

Signal Requirements

Video Composite Signal: 0.5 to 1.5 volts peak-to-peak composite, sync negative, EIA-FCC standard or 405, 625 line standards (819 on custom order), 75 ohm unbalanced.
Sync Input: 75 ohms, 2 to 8 volt, peak-to-peak.

Audio Input

Program Line: High impedance balanced bridge for 500/600 ohm line at —10 dbm level (minimum); or high impedance unbalanced (15K).
Cue Line: High impedance balanced bridge (15K) at —10 dbm (minimum). Built-in crystal microphone.

Operating Characteristics

Tape Speed

7½ or 15 ips as selected by front panel switch.

Recording Time

96 minutes on 14" (35.6 cm) 7200' reel of tape at 15 ips (38 cm/sec).
192 minutes on 14" (35.6 cm) 7200' reel of tape at 7½ ips (19 cm/sec).
Normally supplied for operation with 12" (30.5 cm) reels.

Picture and Sound Separation

18½ frame, sound leads, at 15 ips.
37 frame, sound leads, at 7½ ips.

Stability

Jitter (i.e., disturbance rates greater than 1 cps): ±0.075 μs.
Drift (i.e., disturbance rates less than 1 cps): ±0.1 μs.
Geometric: Less than ±0.15 μs during replay of a recording on the tracks selected to produce maximum error.

Standards

Two preset deviation, pre-emphasis, and scanning standards may be selected by means of a two-position switch, the preset standards are determined by three plug-in circuit modules, one set of three for the desired combination of modulation level, pre-emphasis, or scanning standards.

Standards available: 4.28 Mc — 5.0 Mc — 6.8 Mc Dev., Monochrome Pre-emphasis, 525 line, Low Band.
5.5 Mc — 5.79 Mc — 6.5 Mc Dev., Color Pre-emphasis, 525 line, Color.
5.0 Mc — 5.54 Mc — 6.8 Mc Dev., CCIR Monochrome Pre-emphasis, 625 line, Low Band.
7.16 Mc — 7.8 Mc — 9.3 Mc Dev., Mono/Color Pre-emphasis, 625 line, High Band.
4.28 Mc — 5.0 Mc — 6.8 Mc Dev., Monochrome Pre-emphasis, 405/525 line, Low Band.
7.06 Mc — 7.9 Mc — 10.0 Mc Dev., Mono/Color Pre-emphasis, 525 line, High Band.

Monitoring Facilities

Video: A Conrac CMC14/R 14" (35.6 cm) video monitor and a Tektronix RM529 waveform monitor are provided.
Audio and Cue: 3-watt audio amplifier has frequency response, 40 cycles to 20 kilocycles. Six-position switch monitors Line In, Line Out, Cue In, Cue Out, Instant Audio, and Spare.
System: A built-in "A" Scope provides monitoring of the following
Control Track Playback (Normal Head), Control Track Playback (Simultaneous Monitor Head), Expanded Control Track Playback (Simultaneous Monitor Head), Switcher R-F Output, Drum Tachometer Signal Input to Servo, Drum Error, Capstan Error, Amtec* Error, Colortec* Error, Drum Oscillator for Setting Frequency, Capstan Oscillator for Setting Frequency, Record Control Track Current, Chroma Level, Spares.

Response Characteristics

	525/60 Low Band	*525/60 High Band*
Video		
MONOCHROME		
Bandwidth:	Flat to 3.8 Mc; —3 db at 4.2 Mc. Tolerance ± 1 db	Flat to 4.1 Mc; —3 db at 4.5 Mc. Tolerance ±0.5 db
Signal-to-Noise Ratio:	45 db peak-to-peak video to rms noise on interchange basis (Monochrome)	46 db peak-to-peak video to rms noise on interchange basis (Monochrome and Color)
Transient Response: (Utilizing 2T sine² pulse)	Maximum K-Factor 2%	Maximum K-Factor 1%
Low Frequency Linearity:	2% Blanking to White (maximum)	2% Blanking to White (maximum)
Rise Time: (.02 μsec or less rise time on input pulse)	0.12 μ/sec maximum	0.11 μ/sec maximum
COLOR		
Signal-to-Noise Ratio:	40 db peak-to-peak video to rms noise on interchange basis	46 db peak-to-peak video to rms noise on interchange basis
Differential Gain:	Less than 4% Blanking to White	Less than 4% Blanking to White
Differential Phase:	Less than 4° at 3.58 Mc off tape	Less than 4° at 3.58 Mc off tape
Maximum Color Phase Error: due to Differential Phase, 75% Color Bars, 3.58 Mc Subcarrier	2° maximum	2° maximum
Moire: (Color bars 75% modulation, 3.58 Mc)	—24 db minimum	—40 db minimum

	625/50 Low Band	*625/50 High Band*
Video (International)		
MONOCHROME		
Bandwidth:	Flat to 4.5 Mc; —3 db at 5.0 Mc. Tolerance ±1 db	Flat to 5.5 Mc; —3 db at 6.0 Mc. Tolerance ±0.5 db
Signal-to-Noise Ratio:	42 db peak-to-peak video to rms noise on interchange basis (Monochrome)	43 db peak-to-peak video to rms noise on interchange basis (Monochrome and Color)
Transient Response: (Utilizing 2T sine² pulse)	Maximum K-Factor 2%	Maximum K-Factor 1%
Low Frequency Linearity:	2% Blanking to White (maximum)	2% Blanking to White (maximum)
Rise Time: (0.02 μsec or less rise time on input pulse)	0.10 μ/sec maximum	0.08 μ/sec maximum
COLOR		
Signal-to-Noise Ratio:	———	43 db peak-to-peak video to rms noise on interchange basis
Differential Gain:	———	Less than 4% Blanking to White
Differential Phase:	———	Less than 4° at 4.43 Mc off tape
Maximum Color Phase Error: due to Differential Phase, 75% Color Bars, 4.43 Mc Subcarrier	———	2° maximum
Moire: (Color Bars 75% modulation, 4.43 Mc Subcarrier)	———	—30 db minimum

Audio

Bandwidth: ±2 db, 50 cps to 12 Kc at 15 ips
±2 db, 50 cps to 10 Kc at 7½ ips
Signal-to-Noise Ratio: 53 db below 3% distortion at 400 cps
Flutter and Wow: 0.15% rms at 7½ ips, 0.10% rms at 15 ips measuring components from 0.6 to 250 cps

Cue Track

Bandwidth: ±3 db, 60 cps to 8 Kc at 15 ips
±3 db, 60 cps to 6 Kc at 7½ ips
NOTE: Response has a 20 db notch at 240 cycles on 60 cycle systems; 20 db notch at 250 cycles on 50 cycle systems.
Flutter and Wow: Same as audio channel.

These specifications supersede all previous specifications, stated or implied. Term financing and leasing available on all equipment and systems.

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BROADCAST NEWS

NAVAL PHOTOGRAPHIC CENTER EMPLOYS TAPE-FILM CONVERSION TO STEP-UP PRODUCTION OF MOTION PICTURE FILMS

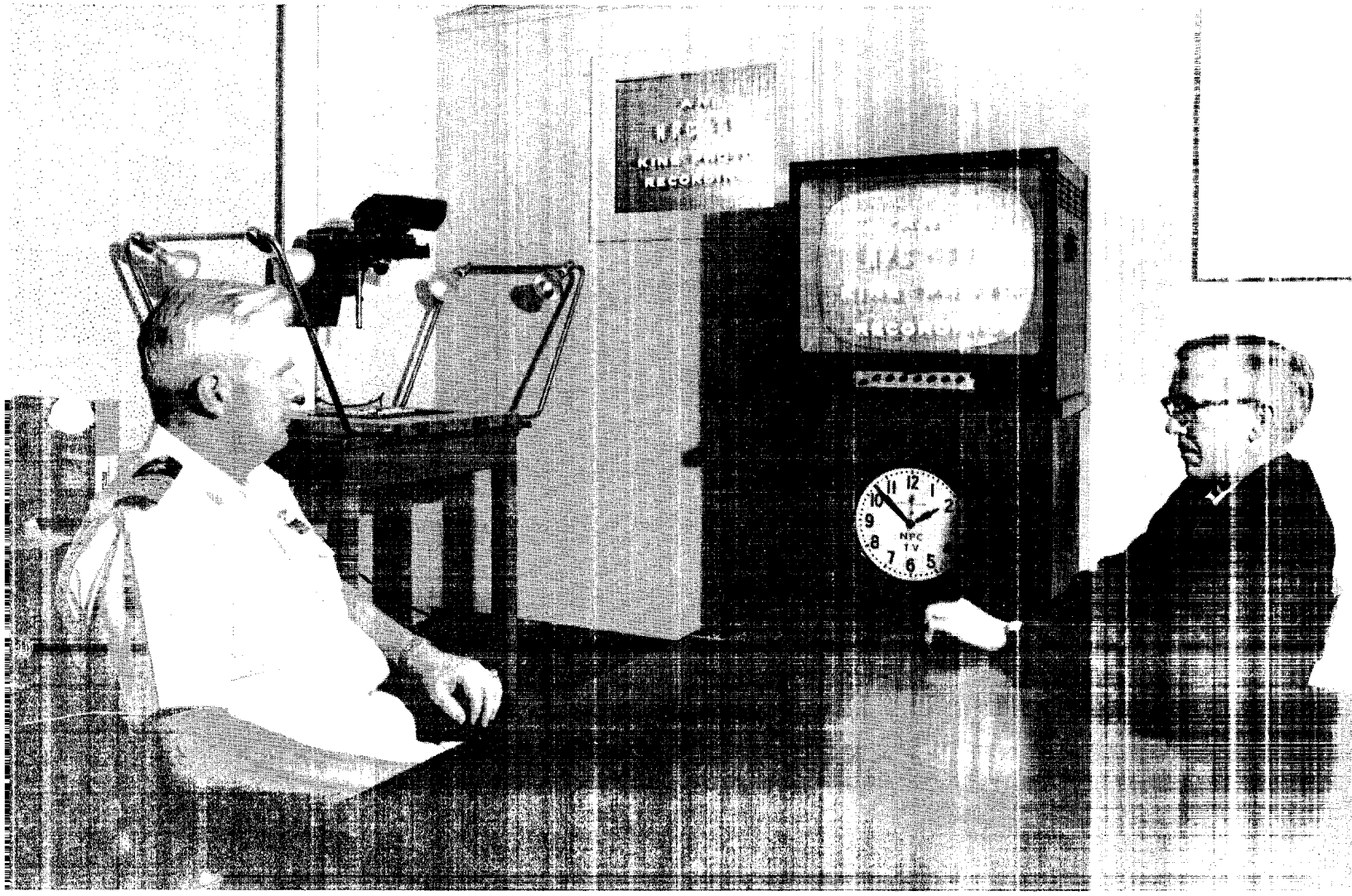

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FIG. 1. U.S. Naval Photographic Center, Washington, D.C.

NAVAL PHOTOGRAPHIC CENTER EMPLOYS TAPE-FILM CONVERSION TO STEP-UP PRODUCTION OF MOTION PICTURE FILMS

Live Television Production Techniques Used For Subjects Difficult to Cover by Standard Film Techniques

Out of a background rich in experience, the Naval Photographic Center has developed a unique method for making motion pictures by employing the immediacy of television. The heart of the new system is a combination of two devices, the TV Tape Recorder and the TV Film Recorder. This combination of equipments speeds production of films by capturing studio subjects on tape as the action occurs and then transferring the electronic picture to film within a matter of minutes. By this means, subjects of fleeting existence (that cannot be re-photographed the next day) are captured on film for widespread distribution. Information can be gotten to personnel as fast as it happens. Subjects not otherwise available can be given widespread distribution via films. All this assists tremendously in the program of making training and indoctrination films, revealing new devices, providing leadership guidance, and expediting decision making.

"Closed circuit television was the giant step that speeded up high quality film production by NPC. It makes use of a newly developed TV Film Recorder that eliminates shutter-bar and produces excellent results on film conversions. It also added immediacy to our recorded communications and provided the flexibility needed for rapid and effective integration of all our photographic media." So stated William G. Wilson, Head, TV Branch of the Naval Photographic Center, Washington, D.C.

Description of TV System

The closed circuit TV system consists of studios, control room with switching equipment, a TV film chain, 2 TV tape recorders, and a TV film recorder. The production may be an audio-visual instructional presentation, a rehearsed program with talent, an interview, a lecture or a briefing. The program is produced in a regulation studio, equipped with three television cameras, monitors and microphones, necessary lighting and staging equipment, and TV production personnel.

The control room contains video and audio controls to get proper picture and sound quality. There is also switching and effects equipment to put the pictures in proper sequence with visual smoothness of execution.

The TV film chain is used for inserting film clips and slides into the production. The television tape recorders are used to make original recordings, and for a check on quality of the production before disassembly of the set and disbanding of the talent. The TV Film Recorder is employed to convert the television tape production into a film (either negative for printing or positive print complete with sound track).

ADVANTAGES OF TV FACILITY

"If the NPC television facility had an insignia, I think it would be the face of a clock superimposed upon a page of a calendar, seen on the face of a cathode ray tube.

"TV production techniques buy that most elusive of commodities time. The quickly produced kinescope communicates information that can be handled within studio confines, and does it well. By so doing, it not only provides the Navy with an additional source of audio-visual material, but also frees the Navy's motion picture program for projects of increasingly ambitious effort."

CAPT. M. P. MACNAIR,
Commanding Officer,
Naval Photographic Center

FIG. 2. Capt. MacNair, Commanding Officer of NPC, and W. G. Wilson, Head, TV Branch, compare TV monitor display of video tape with rear-screen projection of same subject two minutes after conversion to film.

FIG. 3. NPC-TV cameramen pick up a typical interview for recording on TV tape then to be transferred to film for editing and for distribution to the fleet.

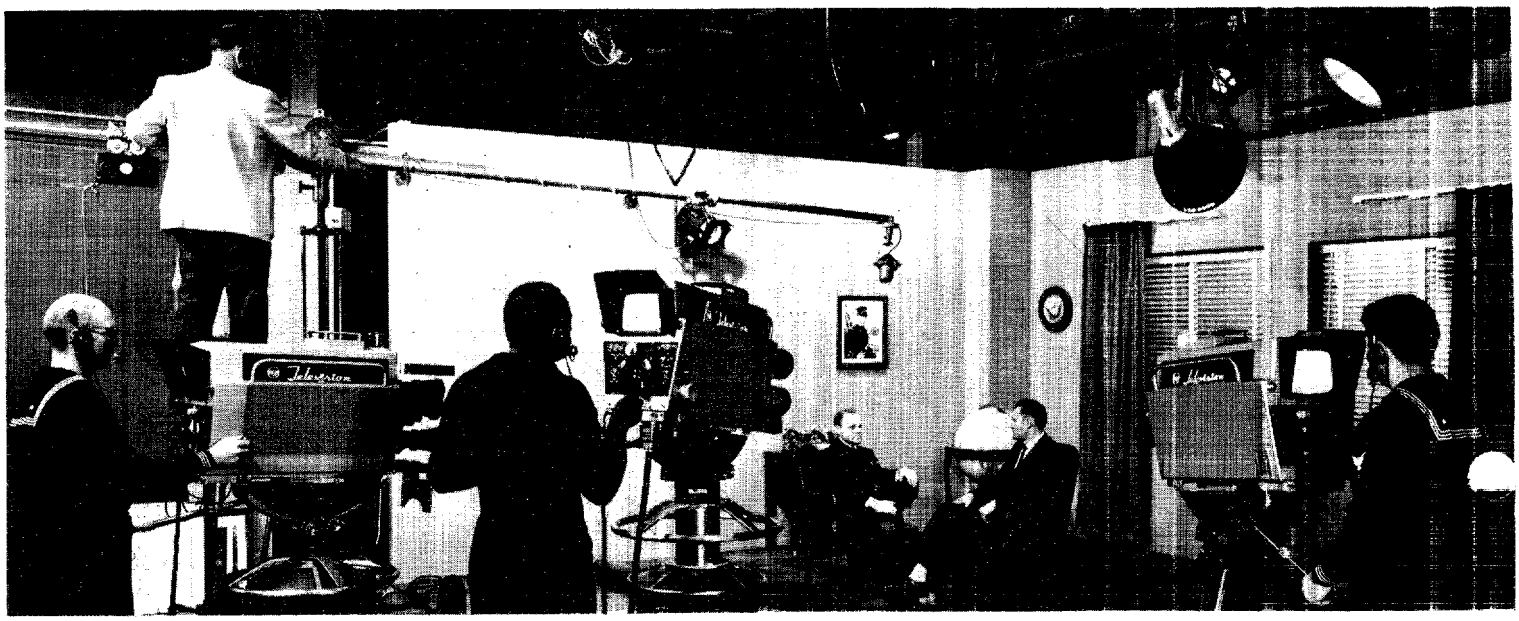


FIG. 4. Television tape machine used for recording TV studio pickups. Also used for playback of TV tape recordings to feed the Kine-Recorder.

FIG. 5. RCA TV Film Recorder which transfers TV signals (from the TV Tape machine) to 16mm film stock (positive or negative.)

TV Beginnings

Early in 1958, the Navy set out to discover the contribution TV could make to the operation at Anacostia. Two TK-31 field cameras that had been used for research and evaluation at the Naval Training Devices Center, Sands Point, L.I., and an early model kinescope recorder were installed. A closed circuit TV pickup and recording system was set up to study TV techniques. NPC found the system extremely useful for inserting live pickups, such as interviews and briefings, into the films.

Advantages of Film Conversions

By 1963, both the training film and other film services had undergone drastic changes in techniques and methods resulting in more efficient camera work and

FIG. 6. Typical interview in studio while making V tape of the program "Leadership Speaks."

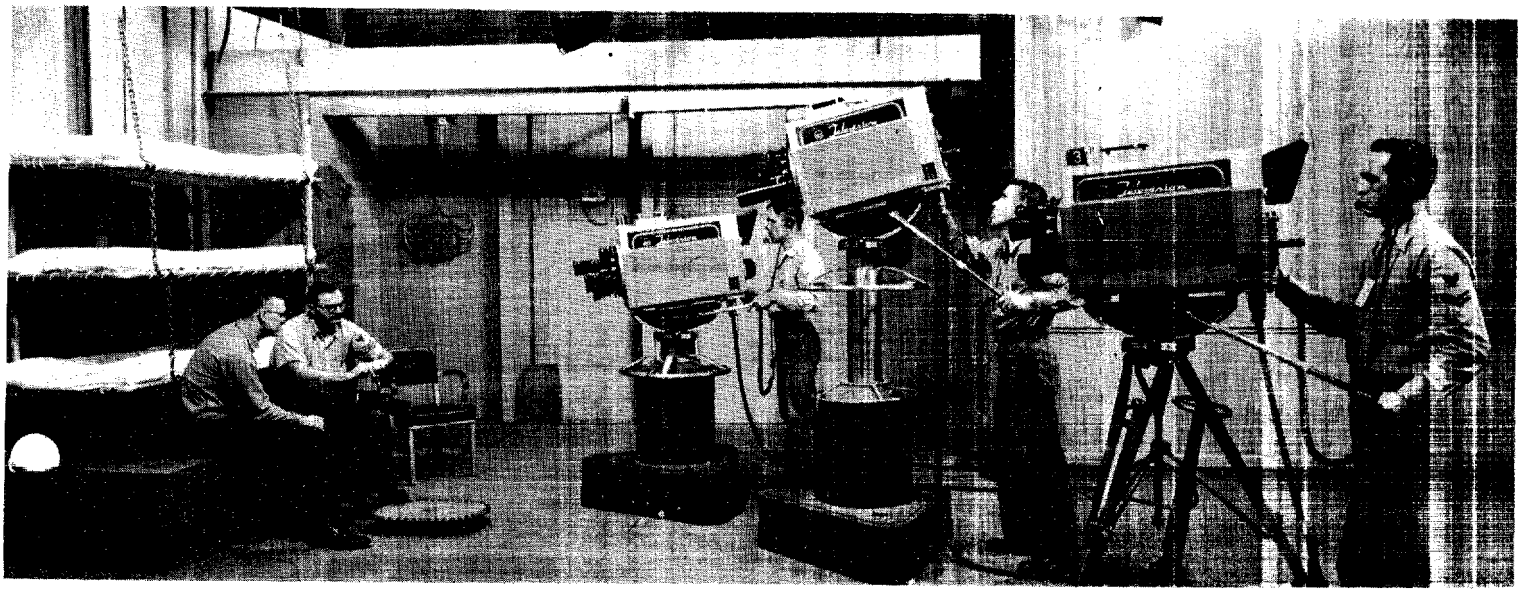
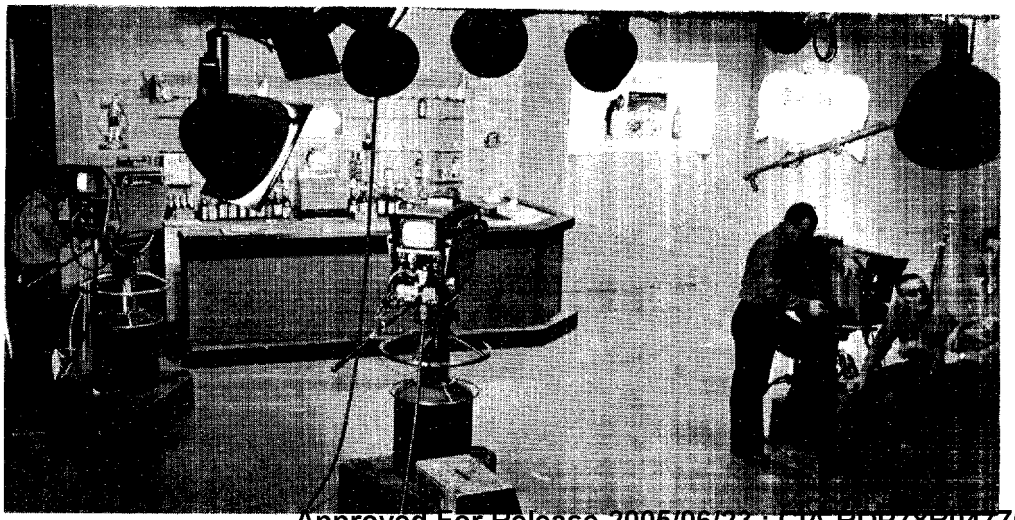


FIG. 7. RCA TK-60 4½-inch cameras are employed in order to procure improved picture quality.



processing. Art and animation were widely used.

But more important was the fact that motion pictures produced only a year ago on film were now being recorded first on magnetic tape. NPC TV had acquired a TR-22 TV Tape Recorder and the new TFR 1 TV Film Recorder, a combination that revolutionized operations at NPC. Television permitted the recording of images with less illumination than needed for film, and since tape provides immediate playback, it was possible to protect it

FIG. 8. Set used in TV film produced by NPC for Federal Bureau of Internal Revenue.

for acceptance and editing. Then, by means of the new TV Film Recorder, it was put on film with little delay. An Eastman Viscomat Processor delivered the finished film in less than 90 seconds after starting the film recorder.

"Recording first on tape, then playing the tape for acceptance and finally transferring the edited tape to film saves time and film," explained Mr. Wilson. "It eliminates the time-consuming steps necessary with ordinary film production: Expose, process, edit, print and screen."

"With our TV system, clients may come in with tape wait ten minutes and walk out with finished film.

"Another advantage of tape is that it is less expensive. Using film and non-professional talent, we may make several studio pickups before we get something we can use. But with tape, we can make any number of pickups, then edit and record on film what we need and return the tape to service again. The tape can also be used for making more than one film print all of equal quality.

"Our end product is nearly always 16mm film, because it is the most universally used medium among the branches and organizations that we serve."

Types of Programs

The facilities of the TV Branch are used by many Bureaus of the Navy as well as other governmental services. Programs have been produced in the television studios for the Bureau of Medicine, Bureau of Personnel and the Internal Revenue Service. Normally, an officer or civilian instructor will assist in production of the program, or an officer will make a briefing presentation. A leadership series features interviews of admirals by well known personalities or messages from the Secretary of the Navy to the fleet.

Some programs are put on film from tapes that have been made by others. NPC gets tapes from such sources as: Great Lake Training Center, Guided Missiles School, Interservce (e.g., Andrews AFB) and NBC (when a prominent naval figure is involved).

Tapes are frequently received for Kinescope conversion from aircraft carriers equipped with closed circuit television to record plane landings by the Pilot Landing Aid Television (PLAT) System. Conversion to film permits study of procedures and analysis of accidents. Slow motion and still frame inspection of film reveals much more information.

FIG. 9. Video control desk contains switcher for selecting cameras, film chain and tape, and remote controls for film and tape.

FIG. 10. Close-up of program switching position showing video switche and remote control and switching panel at right.

FIG. 11. Use of two television tape recorders permits simultaneous rehearsals and programming, and provides backup in recording.

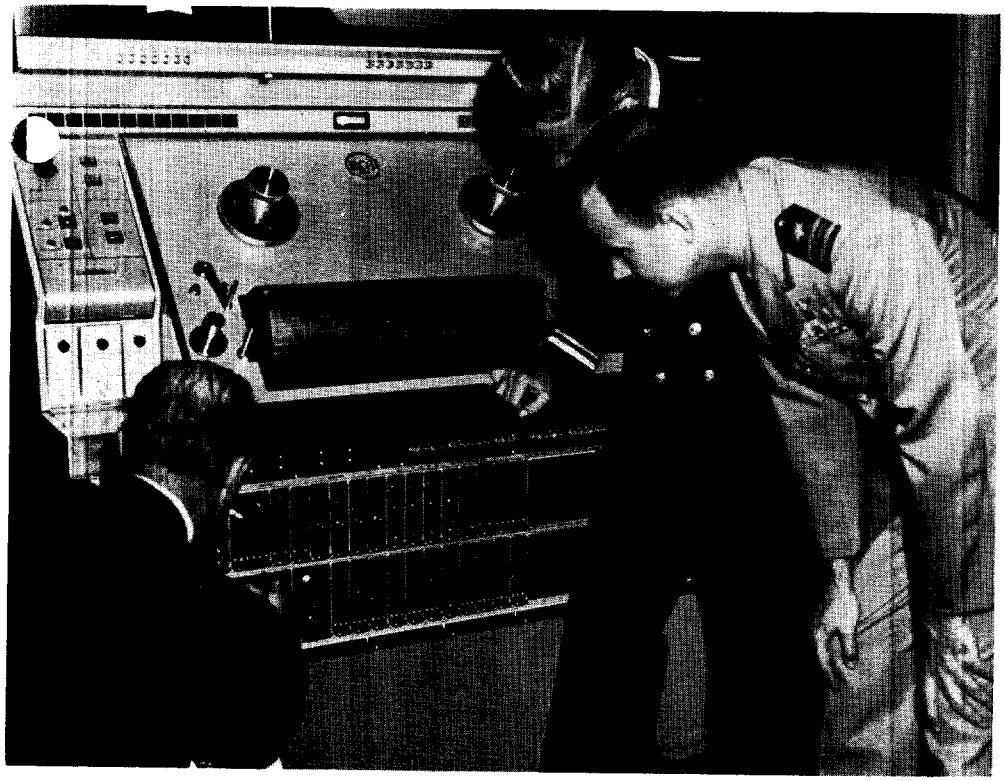


FIG. 12. Serial No. 1 RCA TR-22 TV Tape Recorder being inspected upon arrival at NPC by Lt. Cmdr. Myatt, then Head of Motion Picture Department of NPC.

TV Tape Assures Studio Quality Films

Although originally acquired for film "back-up", the television tape equipment has, in most applications, become the primary means for pickup, replacing film. The reason for this lies in the use of much non-professional talent. As many as 16 "takes" have been required to insure an acceptable film pickup. This has been avoided with the TV Tape machines. Immediate playback permits correction of miscues in short order. The job is finished while the talent is present. And, if urgent, a positive film complete with sound can be produced in minutes by means of the TV film recorder.

TR-22 Perfects Tapes

Many of the television tapes that are converted to film have been made outside the NPC, evidently under less-than-adequate conditions. Imperfections appear that would show up in the finished film unless corrected. Automatic timing correction in playback permits elimination of many of the errors in the original tape.

Future TV Tape Facilities

As the use of television pickup increases, there appears need for use of some portable type of equipment, especially for use in the field or anywhere that studio tape equipment cannot be employed.

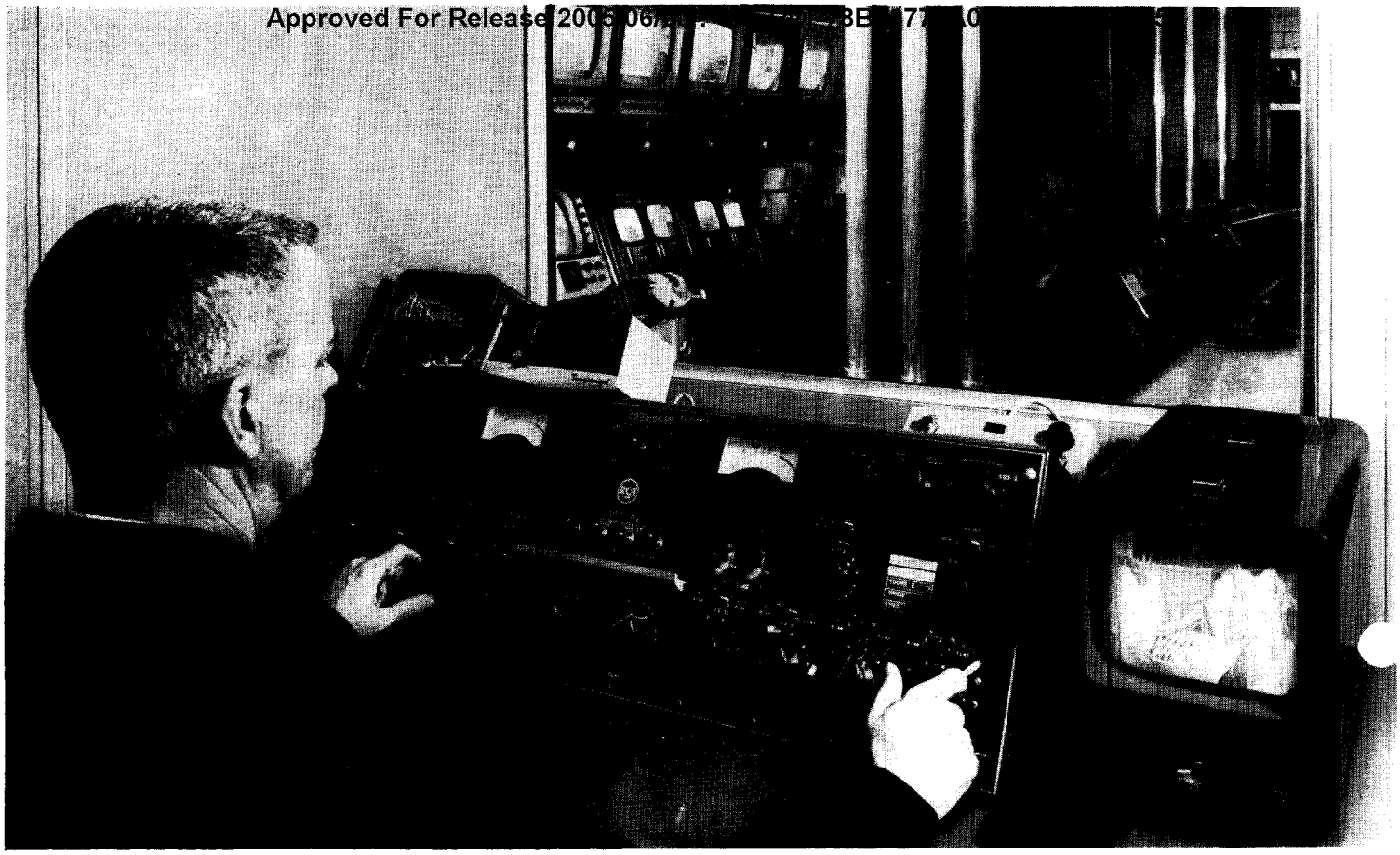


FIG. 13. Audio booth, showing BC-6 Dual Channel Consolette and TM-9 picture monitor. (Note that audio operator can see into control room.)

Also, there appears need for tape projection facilities on a more widespread scale. Just as the various ships and departments have film projection equipment, so it is likely in the future many may have television tape projection equipment. The new "playback only" machines should serve this function.

TV Tape Facilities

Two of the deluxe TR-22 RCA Television Tape Recorders are employed. These are the new fully transistorized machines with interchangeable modules. Serial No. 1 was acquired by NPC. These recorders are equipped with Pix Lock and Automatic Timing Correction. This permits inserts and effects to be achieved without "rollover" or discontinuities. A dropout compensator has been added in order to help correct deficiencies in tapes received from outside sources. Tape machines are equipped for both 7½ and 15-inch operation. Electronic editing is being added.

Two TV Tape machines are installed to give more versatility and to speed production. In this way, two operations can be going on at the same time. One machine can be used for rehearsing and recording a program being produced in the studio. The other machine can be used for transferring a previously recorded program to

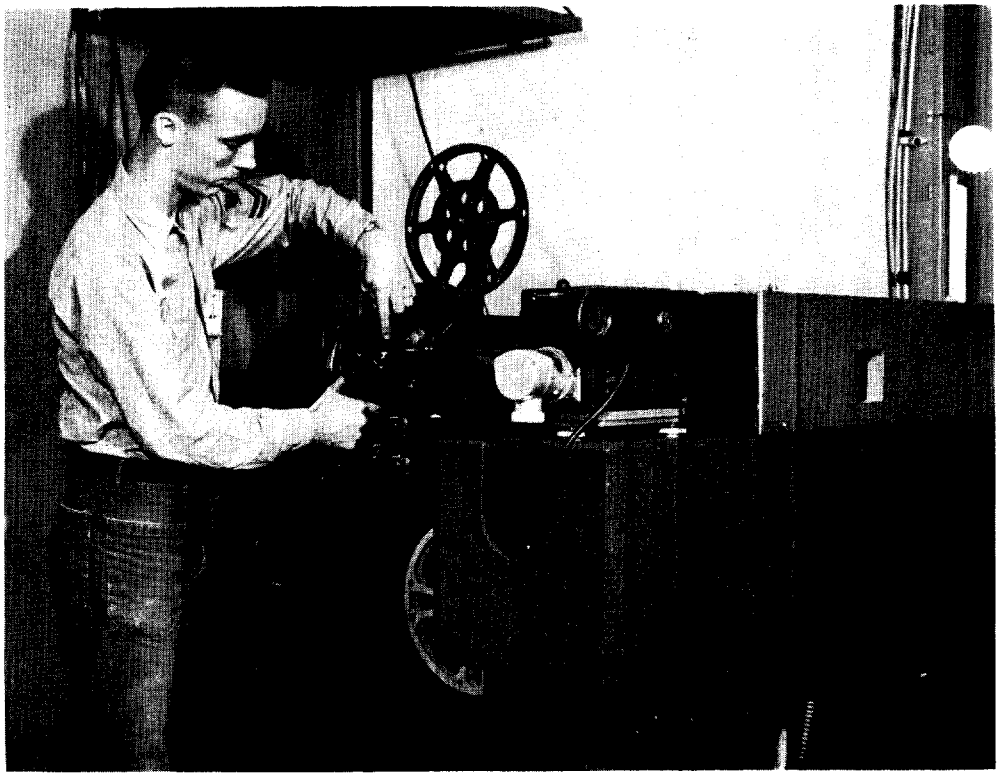


FIG. 14. Television film system, complete with 16mm TV film projector and 35mm slide projector is used for inserts in completed productions of tapes and films.

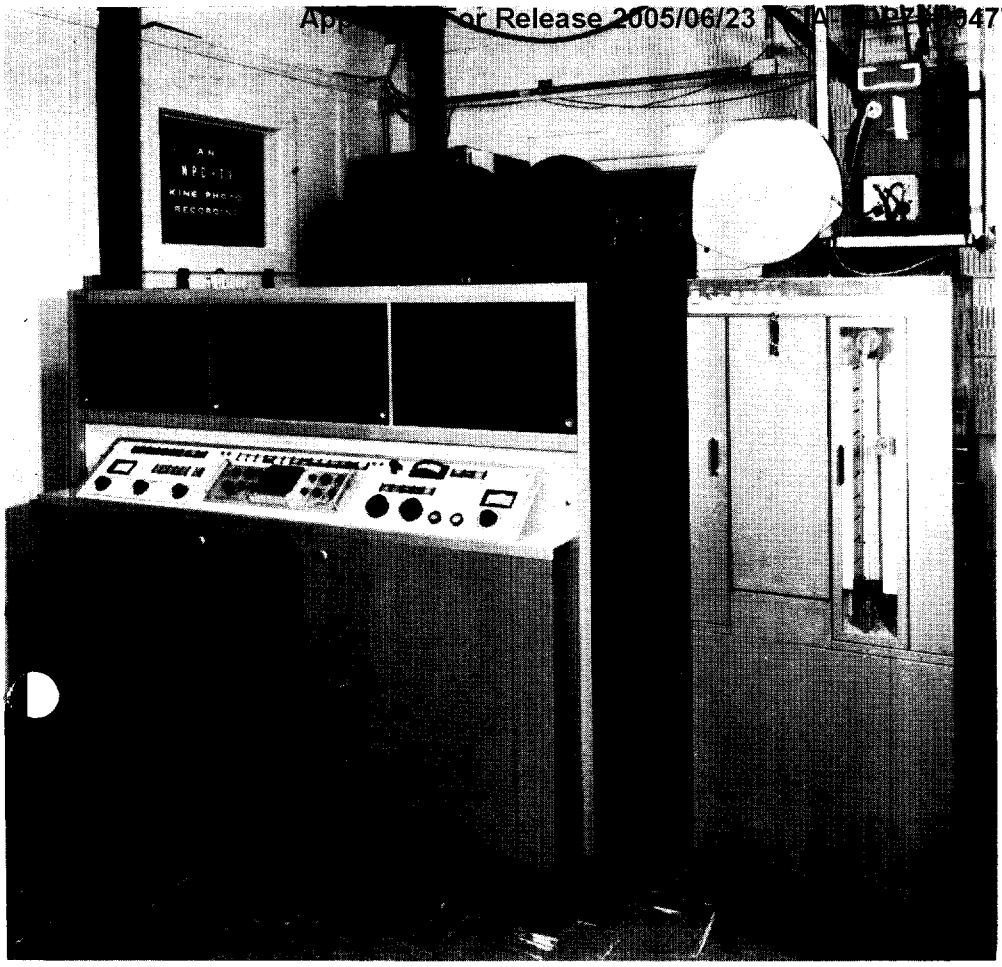


FIG. 15. TFR-1 TV Film Recorder (Kine Recorder) installed with Viscomat Processor (Eastman) produces finished films in minutes. Images from recorded film are projected in reverse on screen (above, at left) for viewing in adjacent conference room.

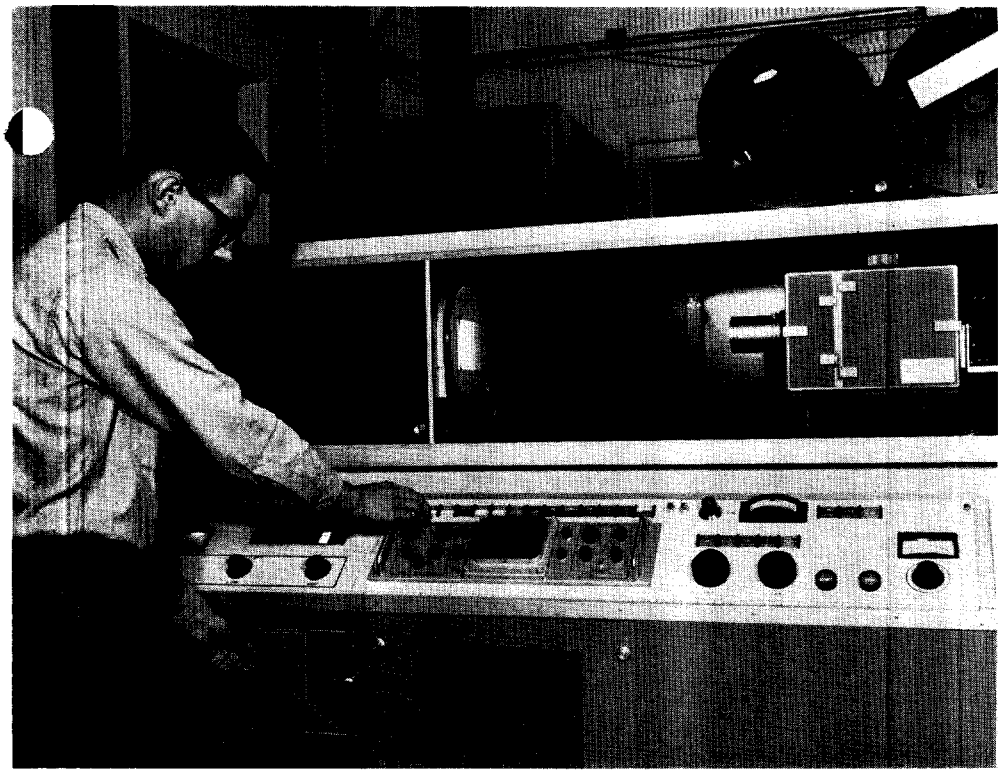


FIG. 16. Controls of Film Recorder are preset to desired standards. Automatic circuits maintain these standards throughout film recording.

all equipments and people can be used at top efficiency and full production achieved.

Furthermore, with two machines, it is possible to obtain two originals of a program. After all rehearsals are finished, both machines can be switched to record the program. This not only gives two original tapes, but also provides for a back-up in the event of error or failure.

Heart of the System

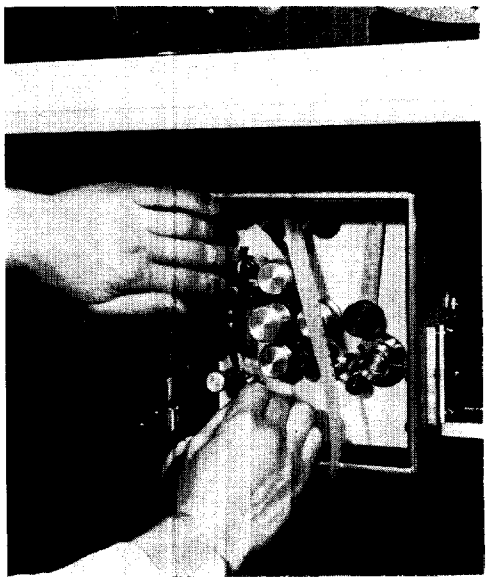
The TFR-1 TV Film Recorder is the most vital piece of gear used in film reproduction, its big feature being automatic calibration. Once the exposure is determined—that is, which neutral density filter is to be used—the "CAL" button is pushed and the predetermined setting is maintained throughout. This is accomplished by a reference pulse which appears automatically on the scope to match the video level to the CAL pulse. It's a good guide to quality uniformity, especially if the video source is not of the best quality. The copy can be preset, and the blacks can be stretched with both exponential and gamma correction which is what is needed for direct positives.

Another feature is the selectable aperture correction for either tape or live material. Of course, ease of operation is an advantage, too. Personnel are stationed here for only a year or two, so there is little time for training. However, men can be trained for operation of the TFR-1 in a matter of only a few weeks.

TK-60 TV Cameras

NPC's reasons for choice of the TK-60 4½-inch image orthicon cameras were

FIG. 17. Camera of TV Film Recorder features ease of loading and threading.



partly based on their extensive background experience with the early TK-31 cameras. These cameras used a "clamp-on-black" method and results were not as good for kine recording as with the TK-60's, which are "clamp-on-white" cameras. While the lighting for the new camera is slightly more critical the quality of picture, particularly gray scale, is much improved, and NPC is primarily interested in quality of picture. Also, the controls are simpler, there being really only one operating control for the TK-60, the iris.

Operating Personnel

NPC-TV uses eight enlisted personnel and four civilians in its operation. These are cameramen, floormen, lighting man, director, TV tape/film operator, kine recorder operator, switching operator, audio and video operators. Technical personnel, when not operating the equipment, double as maintenance personnel.

TV Film Production

The Center's TV film production, which daily averages from 3000 to 4000 feet, is all in black and white. The use of color is anticipated in the future. Both negatives and direct positives are made. Usually multiple copy prints are obtained from outside suppliers.

The TV Branch's principal contribution is the recording of live studio material on film by way of TV tape, but some work consists of recording customers' taped material on film. Recordings are made of special off-air TV pickups such as the Army-Navy football game. NPC-TV averages about two live studio productions a week. Normally, an officer-instructor will help produce the program which is usually an interview by a well-known personality or the presentation of a briefing by a high ranking officer. Sometimes these productions are made to be integrated with already recorded material to make up a composite film or tape.

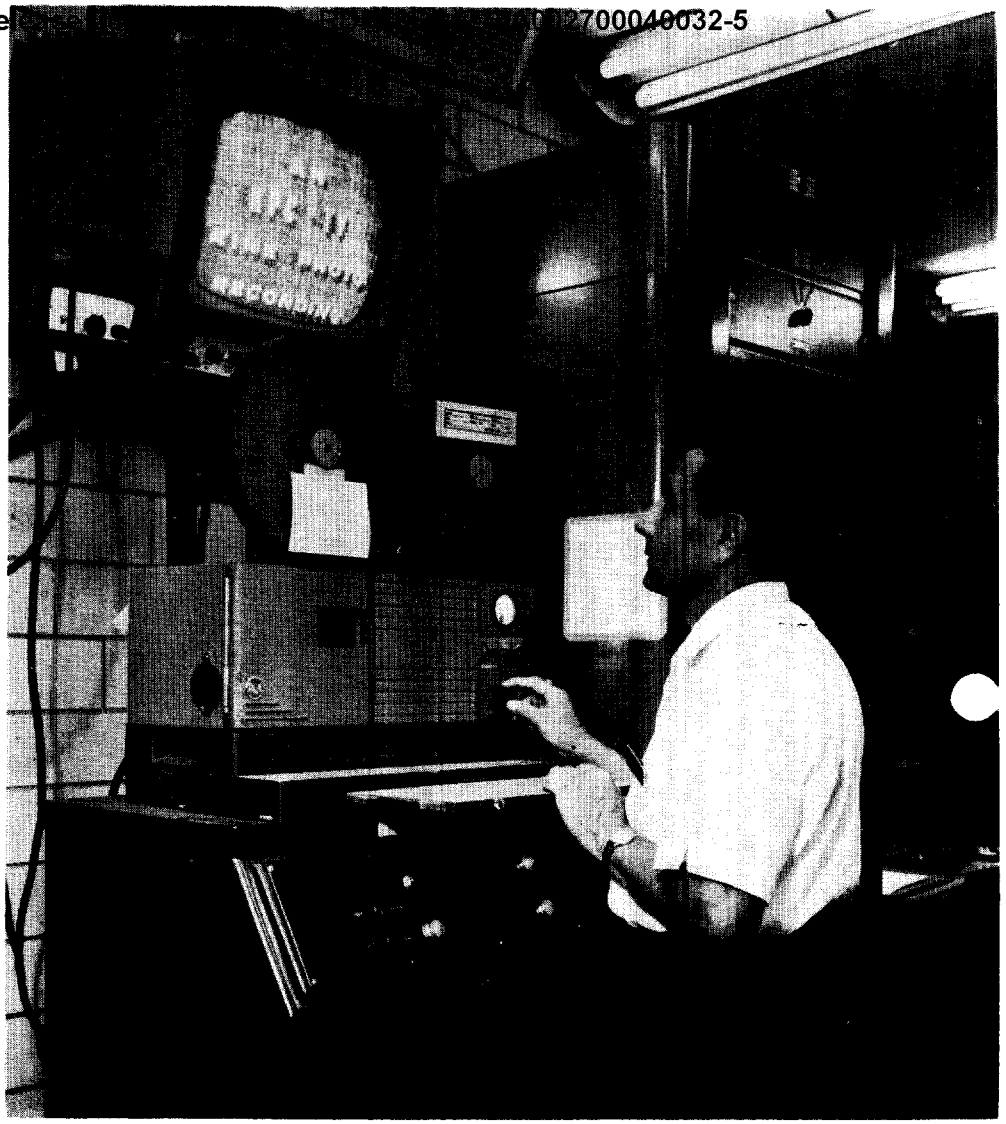
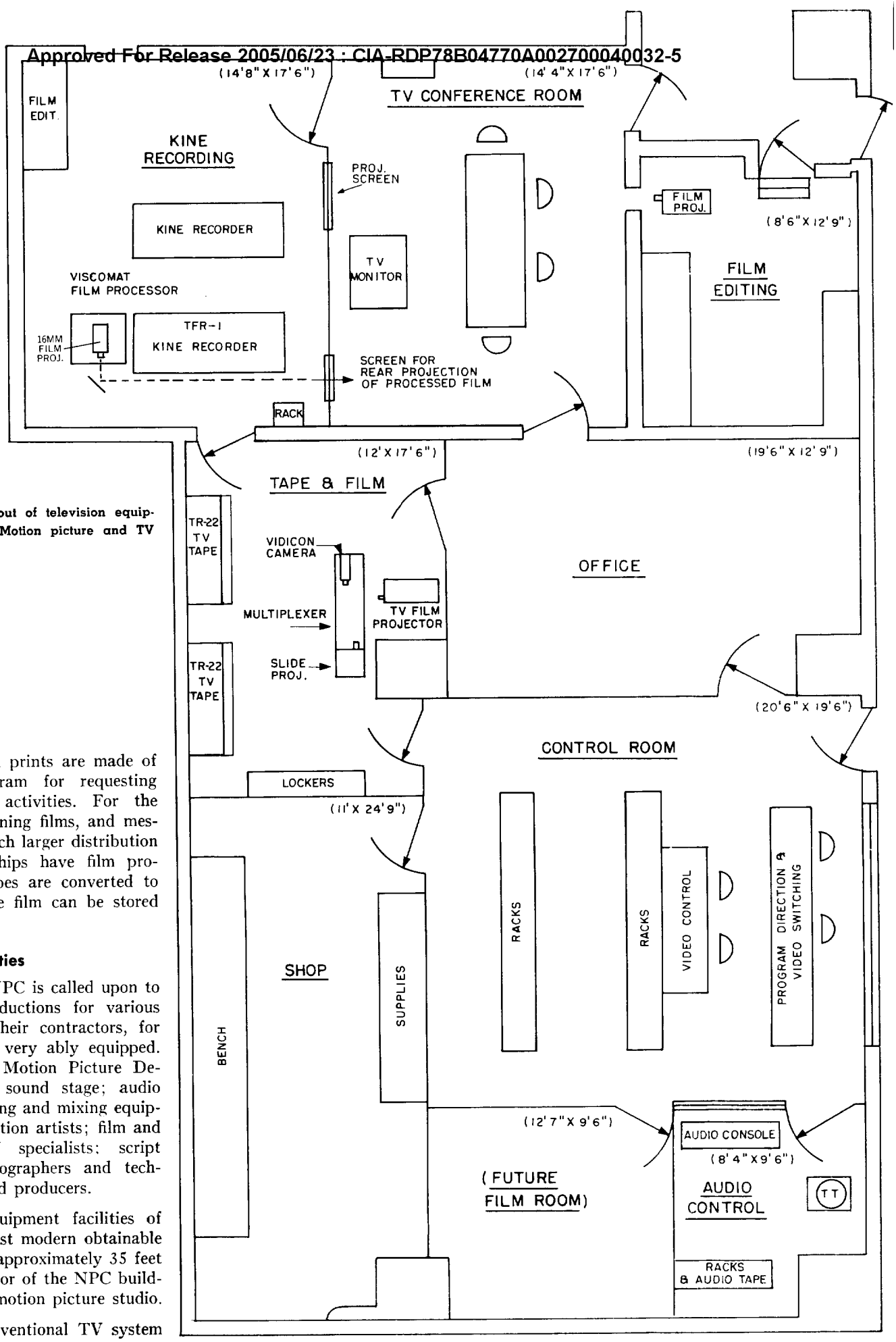


FIG. 18. RCA optical sound recorder used at NPC to record sound on film by using the double system.

FIG. 19. NPC TV Branch has complete facilities for editing of TV produced films.

Productions vary in length and cover a wide range of subjects. One of these productions—a course on psychology—employs nearly 40 hours of film. Others are mostly on evaluations of new equipment, descriptions, instructions and briefings. NPC also produced a series of medical films. NPC's integral film processing facility is a big asset in obtaining high quality films.



20. Floor plan layout of television equipment facilities at NPC. (Motion picture and TV studios are not shown.)

Distribution Via Film

Normally, five film prints are made of each technical program for requesting bureaus and other activities. For the leadership series, training films, and messages to the fleet, much larger distribution is made since all ships have film projection facilities. Tapes are converted to film for storage since film can be stored more easily.

TV Equipment Facilities

Quite frequently NPC is called upon to make full scale productions for various Navy branches or their contractors, for which the Center is very ably equipped. Facilities of NPC's Motion Picture Department include a sound stage; audio film and tape recording and mixing equipment; art and animation artists; film and sound editors; TV specialists; script writers; Navy photographers and technicians; directors and producers.

The television equipment facilities of NPC-TV are the most modern obtainable and occupy an area approximately 35 feet by 60 feet on one floor of the NPC building adjacent to the motion picture studio.

The layout is conventional TV system

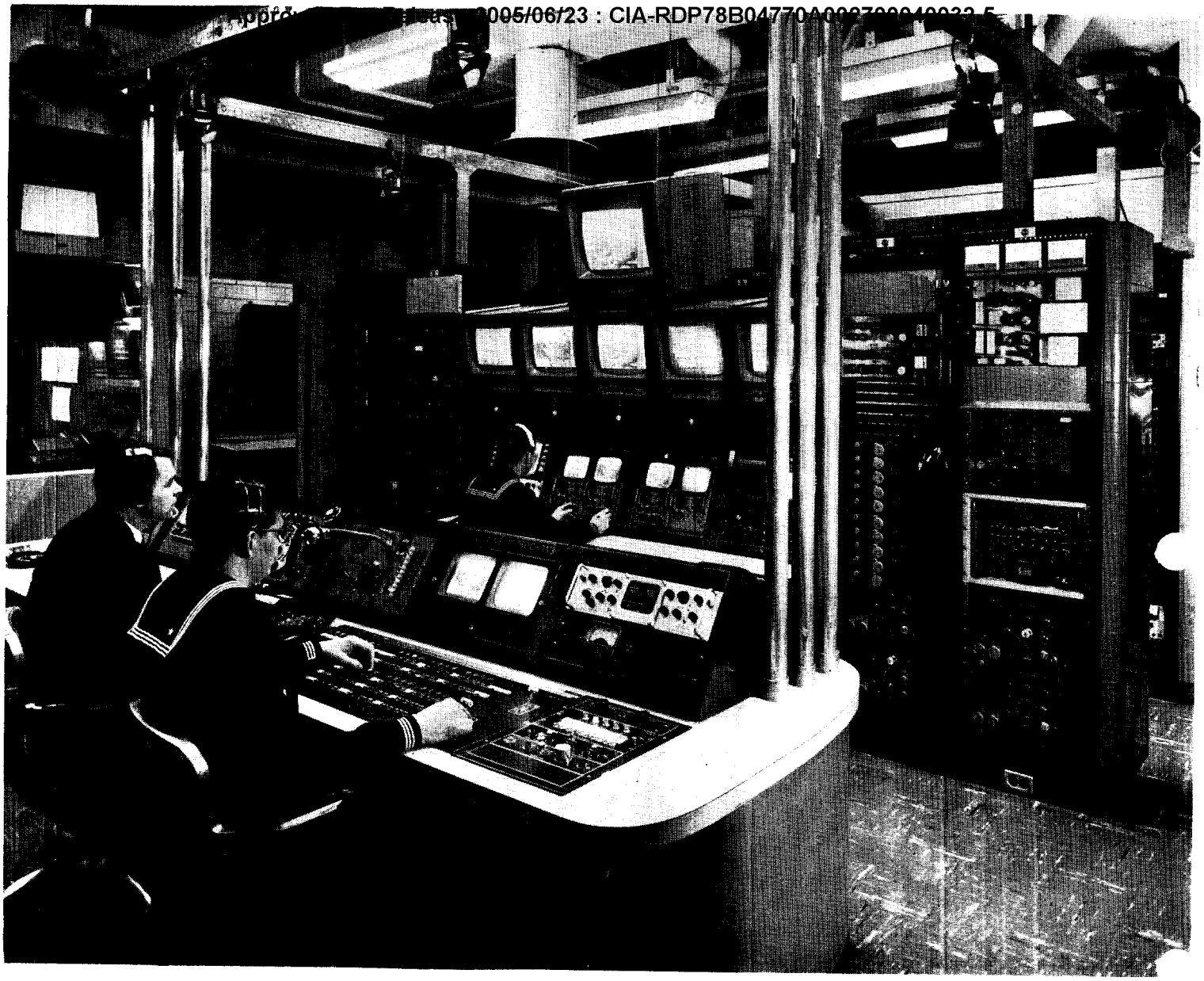


FIG. 21. TV control room at NPC. In foreground is switching and effects position, in rear, video control position (camera controls). Overhead monitors preview picture sources for program director and display on-air signal.

design: three-camera studio, tape and film room, kine recording and TV conference room. A "blind" control room is preferred over the "window-looking-into-the-studio" design, because it allows more flexibility in equipment layout with no sacrifice in operating efficiency.

Two custom desk consoles provide two separate control positions—video control, and program direction and video switching. The video control desk contains a switcher for selecting any of the three cameras, plus the film chain and two TV tape machines. There is also a panel for remote control of both tape machines. At this position the cameras are perfectly matched for one-light (uniform) negative.

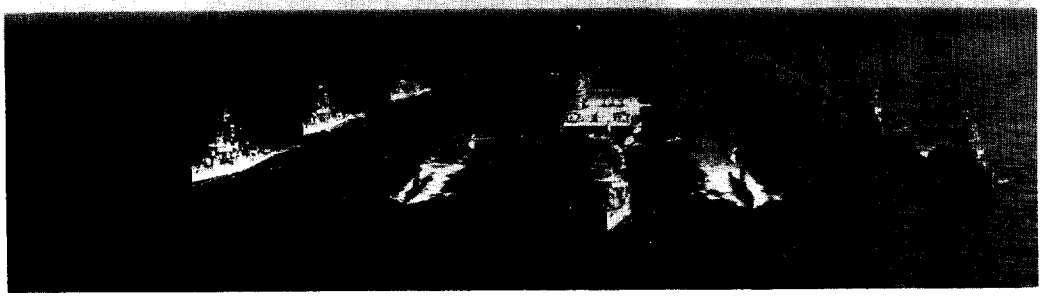
A TS-40 switcher with special effects equipment is located at the video switching position, plus a remote control for the film chain and a custom built slide projector switch for selecting up to 50 slides either sequentially or individually. Rows of lights at the control positions indicate the status of programming and equipment, i.e., program being recorded; rehearsal; playback, etc.

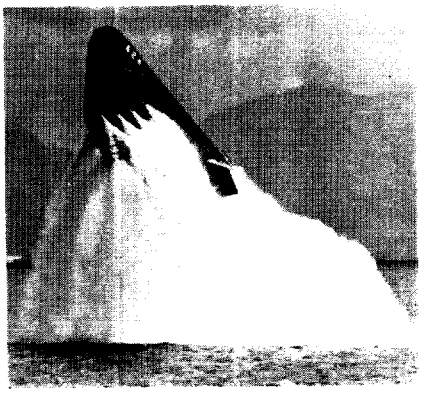
Audio equipment, which consists of a BC-6 Dual Console, tape recorder and one turntable, is located in a small sound studio looking into the control room. As in the motion picture industry, the double system of recording sound on negative film is used.

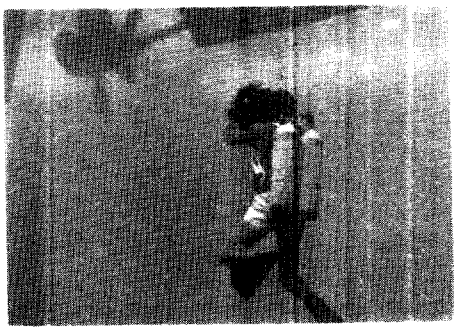
A special feature of NPC-TV is the TV conference room, which contains a TV monitor and a rear projection screen. This enables clients to see and compare the images from the TV tape with those projected from the film being produced by the kine recorder.

Presently, NPC is using a TK-21 film chain with a slide projector and one 16mm projector. A TK-22 film camera chain will be added to allow special effects between the two chains. The TV output is fed into a house monitoring system that distributes the picture to selected points. A master antenna provides for feeding off-air TV pickups into the NPC system.

FIG. 22. The U.S. Naval Photographic Center has a proud record over the past 25 years, often working under dangerous conditions to produce the still and motion picture footage needed by the U.S. Navy.







History of N.P.C.

Established in 1943 as the U.S. Naval Photographic Science Laboratory, NPC began by first meeting the overwhelming demand for photo services during World W[illegible] II. Highly skilled motion picture and s[illegible] photographic personnel were recruited. Under the supervision of industry experts, a new building (housing a sound stage) and filming studios was constructed. A laboratory was designed, built and equipped with the latest photographic and sound equipment.

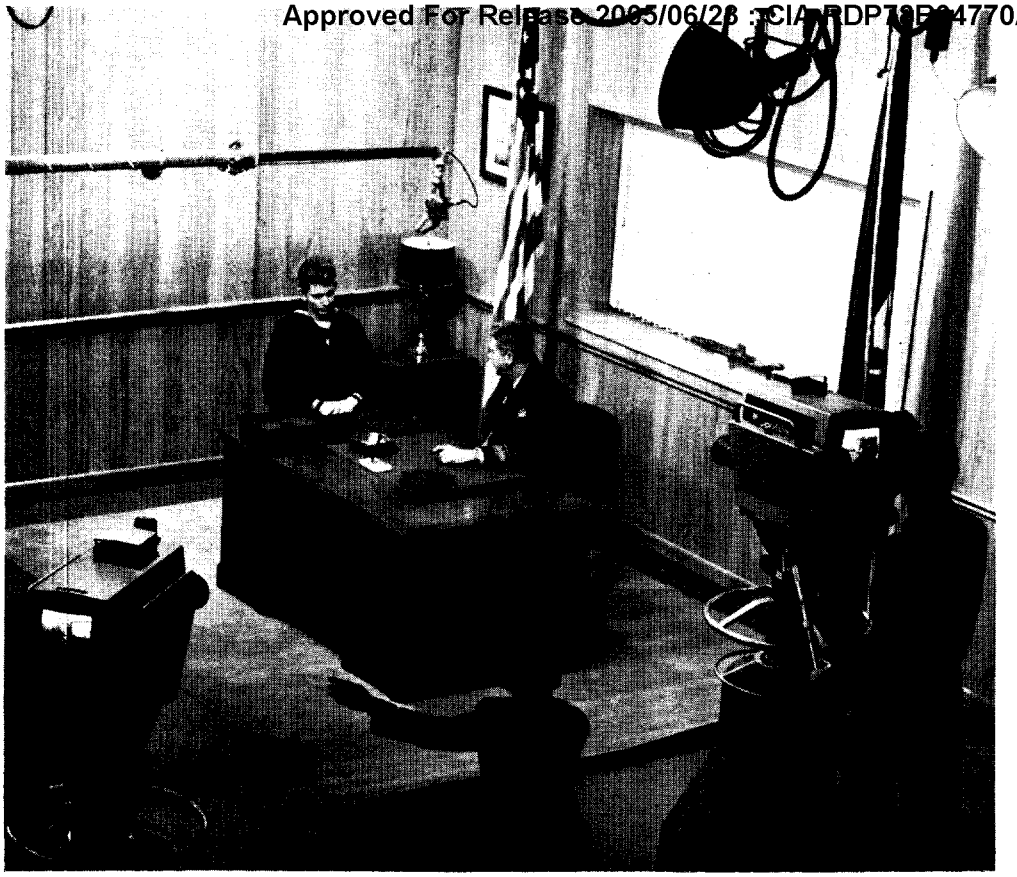
In short order, the new facility was an efficient, swift moving team consisting of a Research and Development Department, Motion Picture Department and Still Picture Department. These departments plus a full scale film processing facility filled the demand for Naval photography of every kind. The R & D Department came up with new developments and modifications of photo equipment, cameras and chemistry. They expanded production and improved quality. The Motion Picture Department made films to train men for the thousands of highly specialized jobs covering just about every subject from battlefield surgery to operation of five-inch/38 guns. They used the concept of motion pictures and audio slide films, a new and radical but effective approach that was to be the forerunner of NPC's well-known Filmgraph technique.

Assisted by industry and the Hollywood U.S. Naval Photographic Services Depot, which provided the Navy's liaison with Hollywood Studios, NPC produced several award winning documentary films. NPC provided the footage and cooperated in the production of NBC's "Victory at Sea."

The Still Picture Department struggled to keep up with the processing and printing requests from Government and civilian agencies. But the importance of the operation was signified when a portion of the building was sealed off to become one of the most closely guarded top secret areas in Washington. Navy personnel worked night and day to produce photo mosaics of the Normandy Beaches.

With the end of the war, most of the laboratory staff returned to industry. For NPC, however, the post-war breathing spell was temporary. Its importance had increased as potography has become a critical tool in Navy planning and doctrine and training. As new ships, submarines and missiles became operational, there was a need for film services for training personnel and to provide photo information for intelligence uses, and to the public and the press. NPC was caught up in these sweeping demands. Improved cameras, films, and papers required special techniques in handling but produced photography of higher quality and in greater volume than ever before.

NPC's success in this endeavor is documented by a series of invaluable technical developments in photography, by the excellence of its tutorial films and by the millions of feet of stock footage film. While instructional films are produced primarily for the Navy's use, their demand by private industry and educational institutions is heavy. An average of about 200 motion pictures a year are completed. These are primarily for training, research and development, technical photographic reporting, recruiting, indoctrination, instruction in new devices and historical purposes. The Processing Division of NPC is capable of developing and printing negative film, releasing prints in 35mm or 16mm, black and white or color. The Division processes and prints over 15 million feet of film yearly.



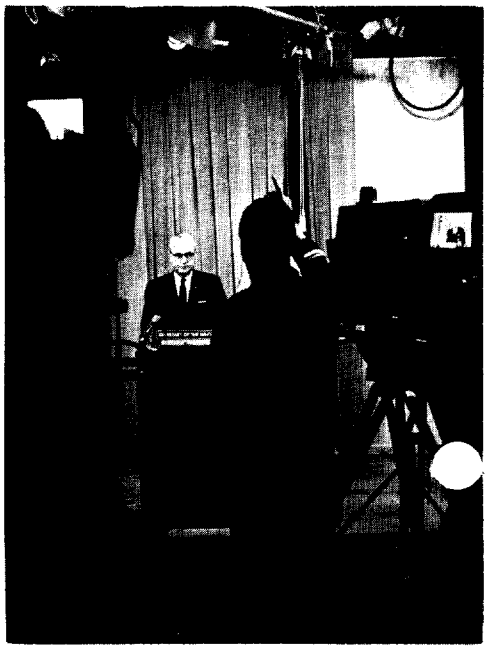


FIG. 23. Today the NPC's ability to produce films via television, speeds the flow of information about latest developments to Navy personnel, making a substantial contribution to Navy training and Fleet readiness.

Major Equipments Used by TV Branch at NPC

TK-60 Cameras (3)
TS-40 Switcher
TK-21 Film Chain
TK-22 Film Chain (on order)
TR-22 TV Tape Recorders (2)
TFR-1 TV Film Recorder
TG-2 Sync Generator
TG-10 Sync Generator (2)
BC-6 Dual Audio Console
Custom Slide Selector
Audio Tape Recorder

Conclusion

The system has need for more in the way of playback facilities, in order to be more productive. By installing the proposed new film projection equipment in a separate room, there will be more space in the present tape room. There is no question about the contribution TV has made to the mission of the Center. As to color, it will eventually be necessary, although not required at the present time.

INCREASING IMPORTANCE OF TELEVISION-TO-FILM CONVERSIONS

(An interview with Mr. Walter Evans, Asst. Head, Motion Picture Dept., NPC)

"Television film recordings are growing in their usefulness and significance to the Navy mainly because of the immense growth in material to be communicated to naval personnel and the speed with which kine recordings can be made.

"Speed is of utmost import to the military. In some cases, we just do not have the time to go through the regular procedures for making a film. The television-to-film procedure provides an essential short cut that saves valuable time in addition ends up with an acceptable print —either positive or negative as the requirement dictates.

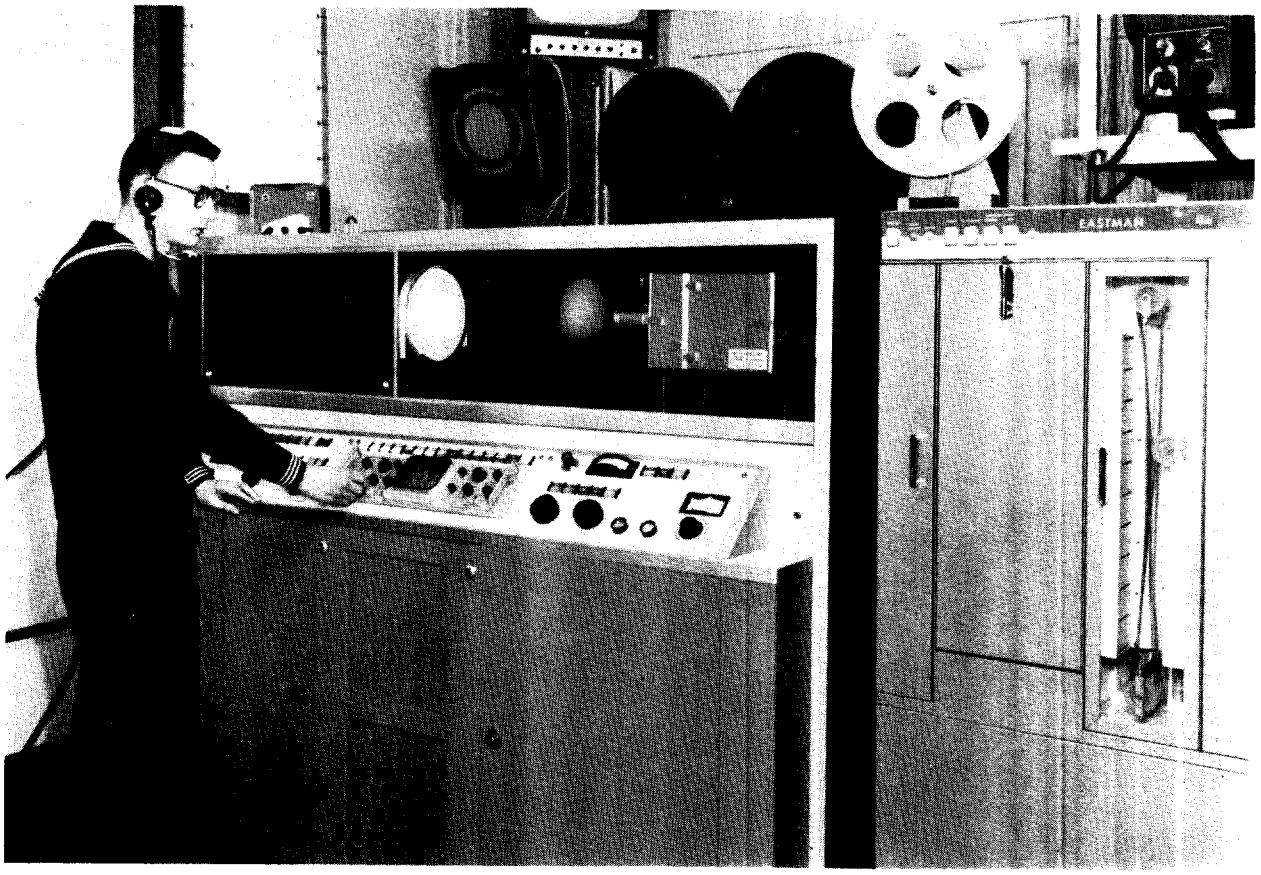
"New developments such as the PLAT system ends up with a television taped recording of the take-off and landing excursion of carrier-based aircraft. These tapes require conversion to film for training of future pilots and perfecting of present pilots. There again the television film recorder serves a vital need.

"Important new developments in areas such as medicine and surgery come in via television. These can be converted and used for instruction purposes by the Bureau of Medicine and Surgery. This department is one of the main clients using TV conversion for teaching and examining clinical practices.

"Occasionally, a lecture or a co[illegible] course could not be picked other than by the immediacy of the television camera. Taping these pickups produces an acceptable source for the TV Film Recorder. Then we can make master negatives for printing and processing in the normal manner to produce as many copy prints as needed.

"Overall, the ability to immediately establish communication by means of TV conversion plus film introduces a whole new concept. New devices and new equipments such as computers can be rapidly introduced to navy personnel by an expert before the TV camera. Immediate playback on TV tape and 2-minute conversion to film gives the new development wide distribution and rapid utilization without the long time delay of the regular motion picture production. All of these new techniques improve this Center's primary contribution to Navy training and to Fleet readiness."

TV TAPE-FILM CONVERSION AT NPC



Type TFR-1 Film Recorder (left) transfers TV signals from television tape machine to 16mm film stock (positive or negative) Viscomat processor (right) produces finished film 70 seconds after it leaves the Film Recorder.

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